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OCTOBER 29, 1984
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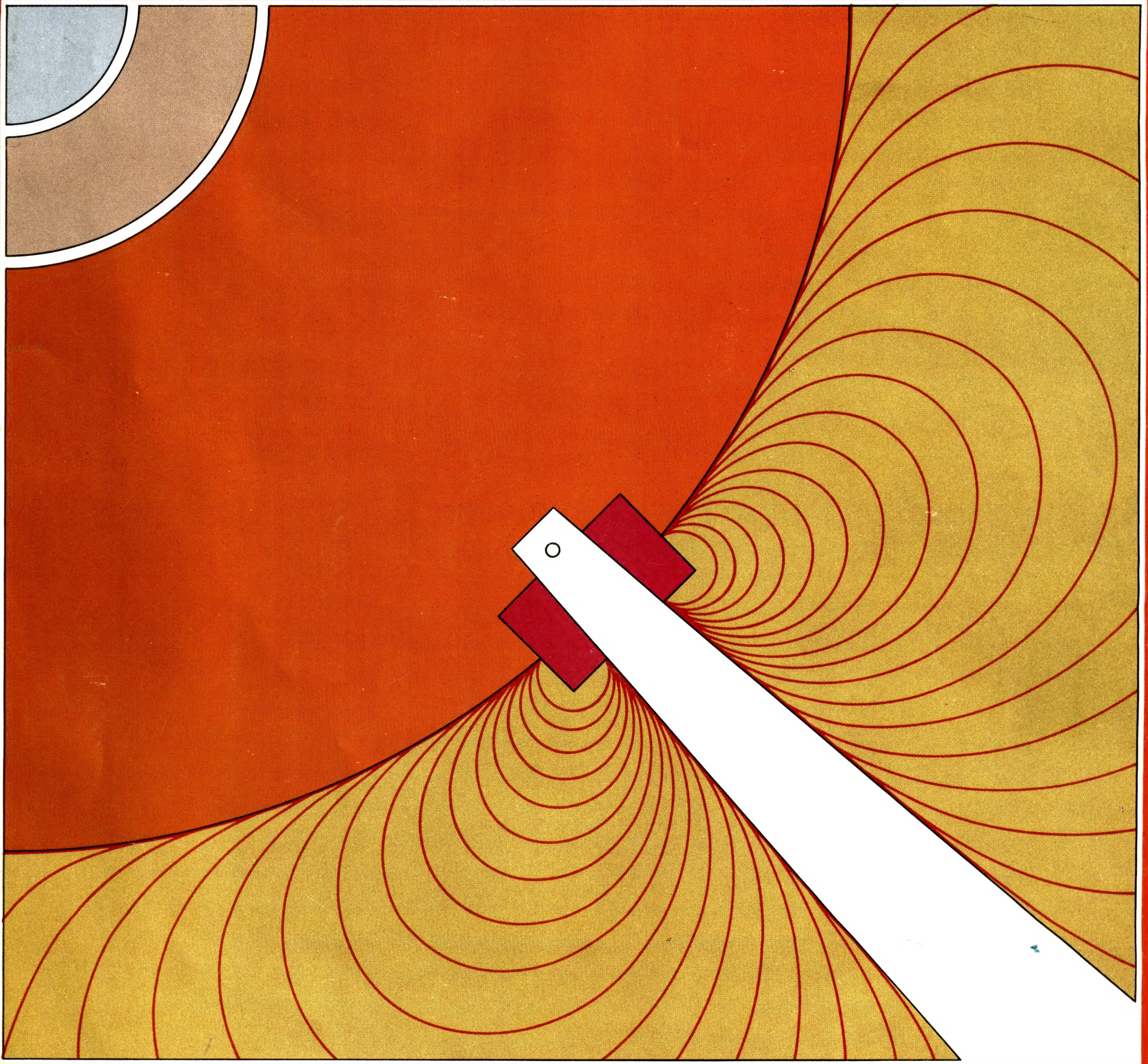

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BOB, CAROL, TED & ALICE

How Four Innovative Design Engineers Found Happiness Using The New DASH-1™ Schematic Design System.

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"DASH-1 has freed my designers from the drudgery of manual schematic design and documentation. Now, we can knock out complex designs in a fraction of the time it used to take. Using the huge DASH-1 parts library (on disk) we can instantly call up any symbols we need — all with pinouts and pin functions. With DASH-1's amazing options, we can generate Net Lists, Lists of Materials, Design Check Reports and other critical documents. I'm a hero in my company now, with productivity at an all-time high."

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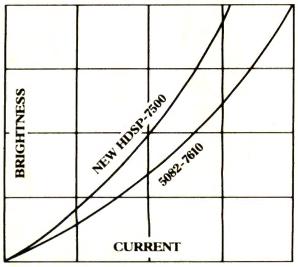

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Next ElectronicsWeek

Test technology aims for CAE integration

Computer-aided engineering work stations are proliferating in the engineering community. But not far behind, and rapidly emerging to handle the growing complexity of chip and board testing, is an array of automatic hardware and software tools that take advantage of CAE's powerful data bases and stimulus/response provisions. Still another area that is stirring in the test community is the way to interface closely spaced test points on very large-scale integrated circuits and tightly packed boards with their associated test hardware. To keep up to speed with the latest test technology, see Senior Editor Howard Bierman's cover story in the next *ElectronicsWeek.*

Digital signal processors come to the rescue

Conventional data-acquisition systems do not just require large, expensive, and drift-prone analog components. Often, signals entering these circuits differ so widely in dynamic range, frequency characteristics, noise, and precision that totally different filters are needed for each input line. Now, digital signal processing makes it possible to replace temperature-sensitive analog filters with the precision and temperature stability of digitally implemented filters. Read all about them next week in *ElectronicsWeek.*

Looking ahead in ElectronicsWeek

In the unending search for more reliable systems with ever greater capability, designers are integrating sophisticated software packages and microprocessors based on read-only memory. By balancing special software-design methods with selected hardware circuits, engineers gain reliability of an order usually associated only with hardware circuits, while maintaining the flexibility of traditional software programs. An explanation of the technique by Thomas M. Dille, John Katausky, Kathryn S. Norris, and Kurt Robinson, all of Intel Corp., will be featured in a future issue of *ElectronicsWeek.*

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ElectronicsWeek

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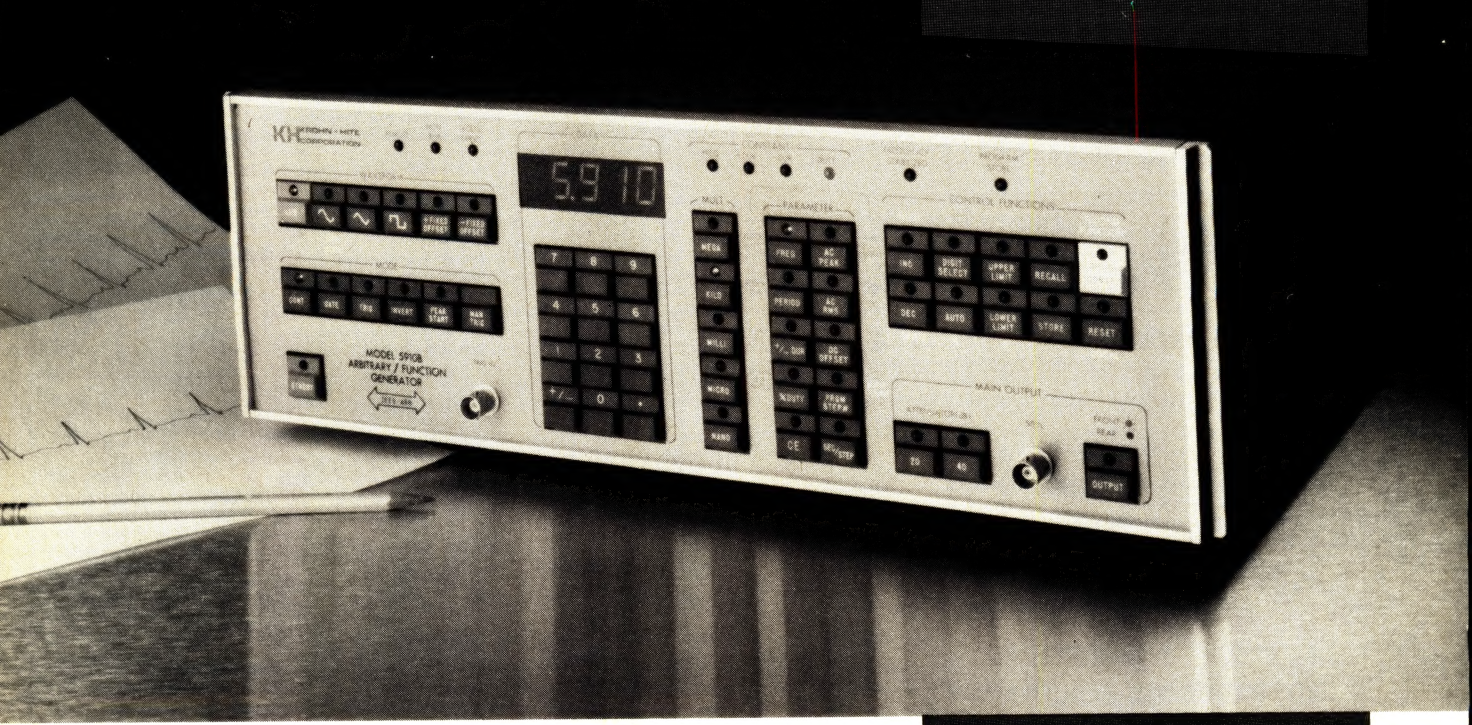
What is the "most wanted" feature in a programmable function generator?

The Arbitrary Waveform Function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ElectronicsWeek

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CMOS is a Solid State of mind.

New 128K CMOS ROMs from Solid State Scientific.

Fast access times (100 ns max.)
Faster system execution.
Fastest turnaround times in the business.

Solid State Scientific has a new 128K CMOS ROM. The 23C128. It's extremely fast—75 ns typical or 100 ns worst case. So you can use it with the world's fastest microprocessors. It has the low power and high reliability of our state-of-the-art CMOS technology. It's available now at prices that make it as cost-efficient as it is technically superior. Production volumes take only 7 weeks, prototypes just 3 weeks.

Forget your NMOS ROMs and EPROMs

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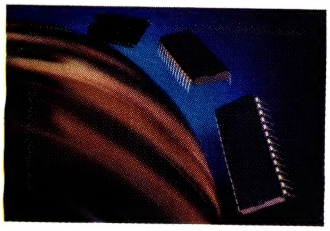

Quick specs on the 23C128

3 Speeds: 150, 120 and 100 ns max. **Standby Current:** 50 microamps max. **Operating Current:** 10 milliamps max. LSTTL-compatible inputs and outputs. 28-pin JEDEC standard. Military versions, too.

Much more CMOS memory coming from SSS

In case you didn't know it, SSS delivered more 32K and 64K CMOS ROMs than any other domestic supplier in the last 2 years . . . and introduced the world's fastest 256K CMOS ROM. Other equally impressive new CMOS memory devices are on the way.

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UP FRONT

Digital tape standard getting nearer

Audio engineers are already hard at work on consumer digital tape players that could quickly follow their disk counterparts into the home and car. Officials from the Dutch firm Philips told the International Congress on Transportation Electronics, meeting last week in Detroit, that current work focuses on selecting a standard method for recording the 2.5 Mb/s channel bit stream required for audio quality equal to the compact disk. Two techniques are under consideration. S-DAT would rely on stationary multitrack heads that would separate the data into 20 different bit streams of 125 kb/s each. The second approach, dubbed R-DAT, would use rotating heads to record the high bit rate on one track. Philips expects the standardization effort to be completed by mid-1985, with product introductions likely in 1986 or 1987.

TI can start novice in chip design for $500

The entry ticket to semicustom chip design can be as little as $500, provided the user has an IBM Corp. Personal Computer or PC look-alike and a new chip-design package from Texas Instruments Inc. Developed by TI's Design Automation Group in Bedford, England, the new IBM PC-based Transportable Design Utility for semicustom ICs can be used for schematic capture, database creation, and simulation of both gate-array and cell-based designs. The simulated circuit description is automatically turned into a chip layout on mainframe computers at TI's local design center.

ITT buys Danish Rovsing's research group

The ITT Group has won the sweepstakes for control of the valuable Systems Engineering Division of Christian Rovsing A/S, the Danish computer engineering group that filed for voluntary bankruptcy in September. Industrial interests in Denmark were concerned that the research team would be lost to the country after the Rovsing group went under following a rocket-like expansion program financed through bank loans and customer advances. It ran into a serious cash-flow problem earlier this year and threw in the towel last month, its capital base wiped out and with around $40 million in debts. The ITT Group acquired the engineering division for about $9 million.

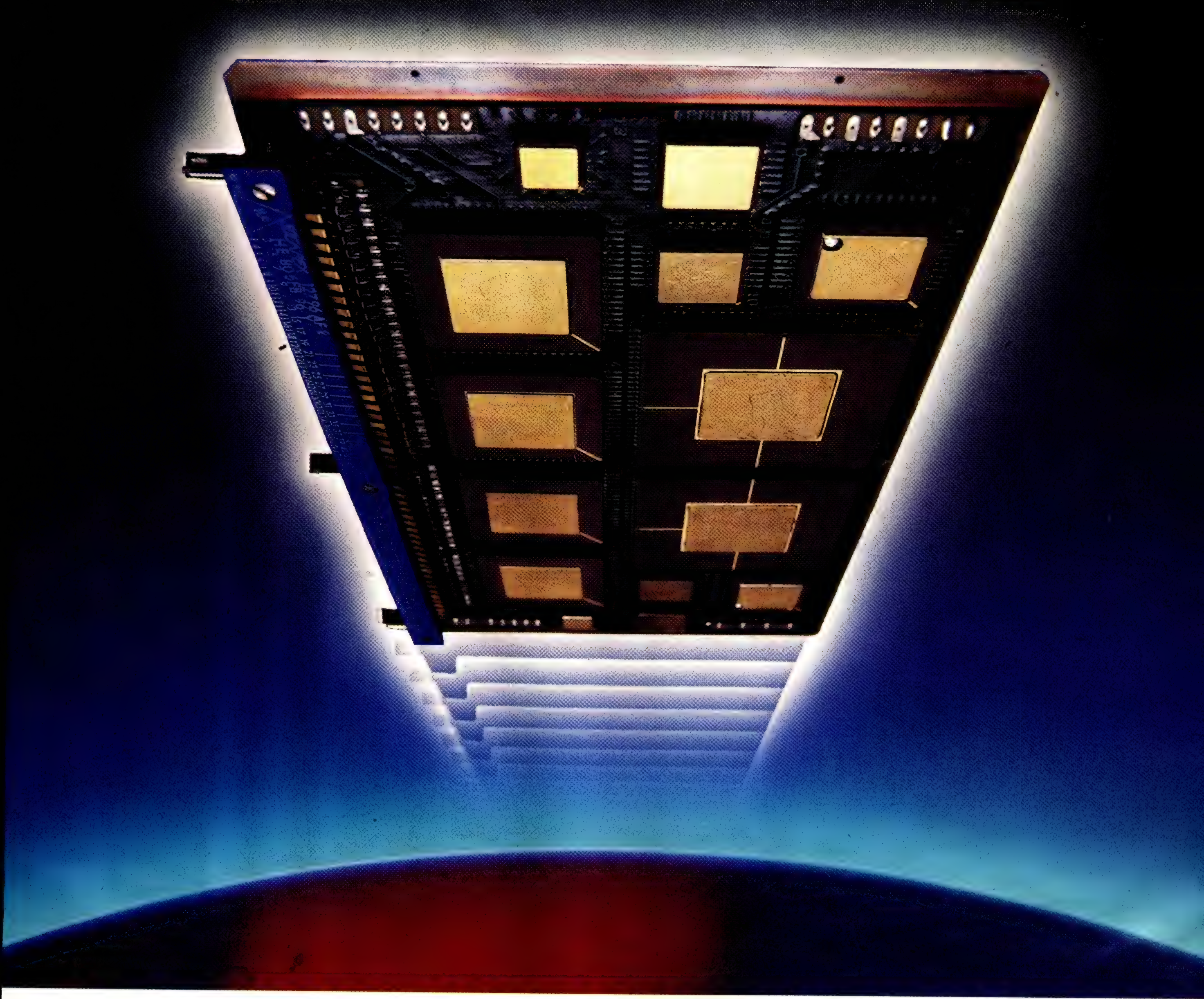
Plans for wafer-fab plant postponed by Lattice

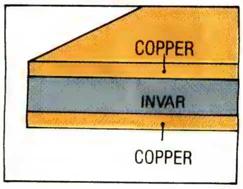
Lattice Semiconductor Corp. has decided to postpone plans for building an ultraclean 6-in.-wafer fabrication plant at its Portland, Ore., base. Instead, the CMOS start-up will have its advanced programmable logic circuits manufactured by VLSI Technology Inc., San Jose, Calif., in return for giving VTI second-sourcing rights. "With this partnership, we can achieve profitablity 18 months to two years earlier," says Lattice.

Xidex, rival disk-media maker, to buy Dysan

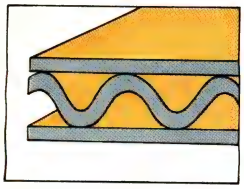
Only a week after it announced intentions to cut back on expansion plans and cut off investment in its smaller affiliates, financially troubled Dysan Corp., Santa Clara, Calif., has agreed to become a subsidiary of a rival disk-media maker, the Xidex Corp., San Jose, Calif. Xidex agreed to provide stock valued at $214.5 million for the purchase. Dysan lost $14.4 million on sales of $161.6 million in the first nine months of this year.

HERE IS PHYCLAD, IMPHY'S "HIGH FIDELITY" SUBSTRATE.





Common Phyclad structure.



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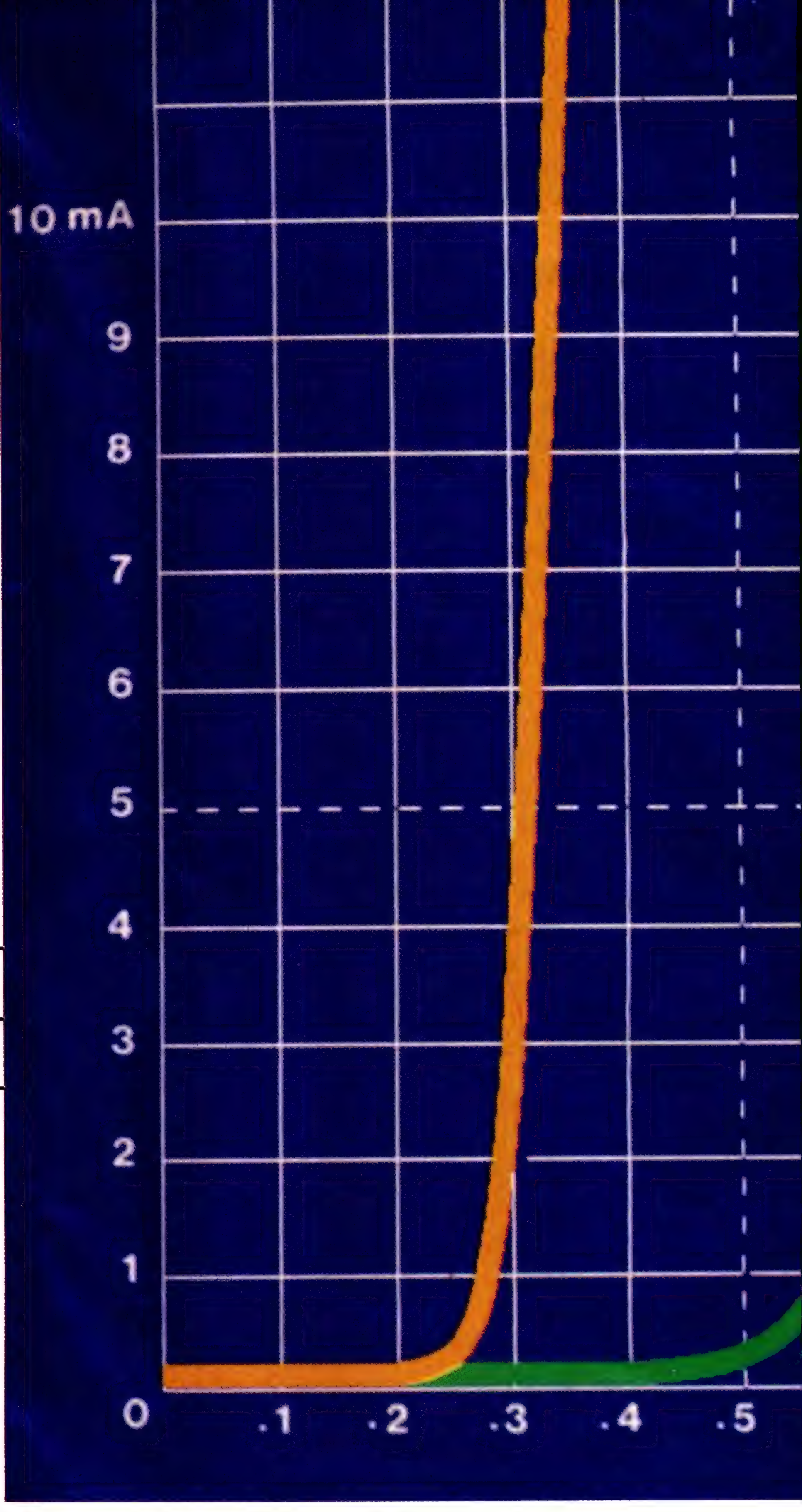

ANOTHER
STEP FORWARD

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Let's take a step forward together.

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The main features of this device are:
- *Low turn-on voltage.*
- *Sub-nanosecond switching time.*
- *Low reverse capacitance.*

These high performance Schottky diodes afford considerable improvements over conventional P/N junction diodes. This is a fact that has long been recognized, however up until now prices have been the limiting factor, restricting applications to professional equipments.

High volume production of devices encapsulated in the rugged double stud D035 and D041 glass packages allows Thomson Semiconductors to offer a low-cost, high reliability machine insertable product suitable for volume small signal and low- cost applications.

Most of the devices are also available in T0236 plastic micropackage well suited for surface mounting purposes.

Application areas cover telecommunications, computers, automotive and consumer oriented fields, market areas that Thomson Semiconductors are at the forefront of technology.

RF AND ULTRA FAST SWITCHING FAMILY

P/N	CASE	V_{RM} (V)	V_F @ 1 mA (V max.)	I_F @ 1 V (mA min.)	C @ 0 V (pF max.)
BAT 17 (1)	T0236	4	0.6 *	–	1.0
BAT 19 (2)	D035	10	0.4	20	1.2
1N6263	D035	60	0.41	15	2.2
BAR 18 (1)	T0236	70	0.41	15	2.0
BAR 10 (3)	D035	20	0.41	35	1.2

(1) Also available as a double diode. (2) Similar to 5082-2900
*(3) Similar to 5082-2810 * @ 10 mA.*

Effective minority carrier lifetime is 100 ps max for all devices.

TO 236 plastic micropackage

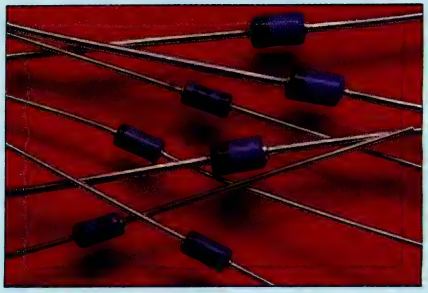
Typically the devices will suit applications requiring:
- *Transistors and digital circuit speed-up.*
- *Wave-form sampling.*
- *Wave-form clamping and clipping.*
- *UHF mixing and detection.*

GENERAL PURPOSE FAMILY

TYPE NO.	CASE	V_{RM} (V)	V_F @ 10 mA (V max.)	I_F @ 1 V (mA min.)
BAT42	D035	30	0.4	100
BAR42 (1)	T0236	30	0.4	100
BAT48	D035	40	0.4	500***
BAT41	D035	100	0.45*	200
BAT46	D035	100	0.45	250
BYV10 (2)	D041	20/40	0.55**	–

(1) Also available as a double diode. (2) Similar to 1N 5817 series
** @ 1 mA. ** @ 1 A. *** @ 0.9 V.*

DO 35 and DO 41 glass packages



Only Thomson Semiconductors offers a fully comprehensive range, filling the gap between low level RF devices and power Schottky rectifiers, with the potential to satisfy markets currently requiring:
- *Replacement of gold bonded Germanium diodes.*
- *Fast recovery low-power rectifiers.*
- *Reverse polarity and circuit protection.*
- *Situations where low-voltage drop and/or ultra-fast switching is a must.*

PACKAGING

Thomson Semiconductors D035 and D041 glass packaged small signal Schottky diodes are available for automatic insertion either as axial or radial tape/reel packaged. The T0236 surface mounting devices are readily available in bulk or Super-8 mm tape/reel film.

RELIABILITY

A built-in guard-ring acts as a transient suppressor both in the reverse and forward direction protecting the structure against voltage surges, such as electro-static discharges.

Thomson Semiconductors small signal Schottky diodes withstand all IEC 68 standard environmental tests. Reliability insurance life tests (storage, HTRB, operating) are periodically conducted.

Outgoing quality levels are within the range of 100 ppm (average defect rate).

HiRel screened devices are available from Thomson Semiconductors on request.

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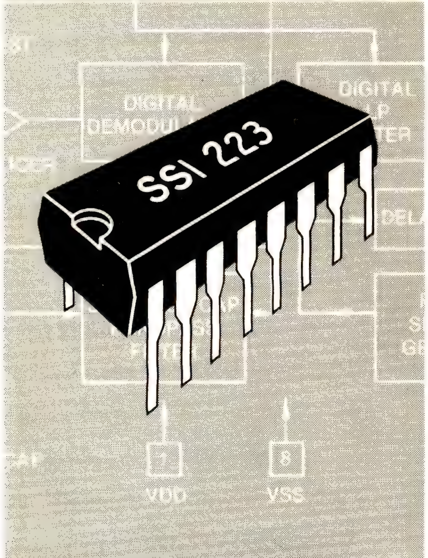

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By utilizing advanced CMOS switched capacitor filter technology, Silicon Systems has been able to produce a chip that minimizes size and power consumption and maximizes reliability. Capable of simultaneous transmission and reception, the SSI 223 can be used for half-duplex operation over a single line system or full duplex operation over a two-line system.

For more information on this low-cost modem, contact: **Silicon Systems,** 14351 Myford Road, Tustin, CA 92680, **(714) 731-7110,** Ext. 575.

silicon systems
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Meetings

International Electron Devices Meeting—IEDM '84, IEEE (Melissa Weiderkehr, Courtesy Associates, 655 15th St. N.W., Washington, D.C. 20005) San Francisco Hilton, San Francisco, Dec. 10-12.

The Sixth DEC-Compatible Industry Exposition, Expoconsul International Inc. (55 Princeton-Hightstown Rd., Princeton Junction, N.J. 08550), Disneyland Hotel, Anaheim, Calif., Dec. 11-14.

Computer Networking Symposium, IEEE and National Bureau of Standards (Robert Rosenthal, B226 Technology Building, NBS, Washington, D.C. 20234), NBS, Gaithersburg, Md., Dec. 12.

Com-Struct '85, Slater Publications Inc. (Com-Struct '85, 163 Highland Ave., Needham Heights, Mass. 02194), Bayside Exposition Center, Boston, Jan. 8-10.

IC Assembly Automation Conference, Intem Show Management (Malka Nagel, Intem Show Management, P.O. Box 390207, Mountain View, Calif. 94039), Le Baron Hotel, San Jose, Calif., Jan. 9-10.

Telecommunications for Pacific Development: Toward a Digital World, Pacific Telecommunications Council (1110 University Ave., Suite 308, Honolulu, Hawaii 96826), Sheraton-Waikiki Hotel, Honolulu, Jan. 13-16.

Advances in Display Technology V, Society of Photo-Optical Instrumentation Engineers (SPIE, P.O. Box 10, Bellingham, Wash. 98227-0010), Los Angeles Marriott Hotel, Los Angeles, Jan. 20-25.

Advanced Semiconductor Equipment Exposition & Technical Conference, Cartlidge & Associates Inc. (Joyce Estill, ASEE '85 Show Manager, Cartlidge & Associates Inc., 1101 S. Winchester Blvd., #M259, San Jose, Calif. 95128), San Jose Convention Center, Jan. 22-24.

Third International Modal Analysis Conference, The International Society for the Modal Testing and Analysis and Union College (Peter B. Juhl, Union College, Graduate and Continuing Studies, Wells House, 1 Union Ave., Schenectady, N.Y. 12308), Orlando Marriott Inn, Orlando, Fla., Jan. 28-31.

Communication Networks Conference & Exposition, Conference Management Group (CW/Conference Management Group, 375 Cochituate Rd., Box 880, Framingham, Mass. 01701), Washington Convention Center, Washington, Jan. 28-31.

Industrial Productivity Conference and Exposition, Society of Manufacturing Engineers (1 SME Drive, P.O. Box 930, Dearborn, Mich. 48121), Expo Centre, Orlando, Fla., Jan. 29-31.

Micro-Computer '85, Messe Frankfurt Ltd. (Philippe Hans, German American Chamber of Commerce, 666 Fifth Ave., New York, N.Y. 10103), Frankfurt Fairgrounds, Frankfurt, West Germany, Jan. 29-Feb. 3.

1985 Office Automation Conference, American Federation of Information Processing Societies Inc. (American Federation of Information Processing Societies Inc., 1899 Preston White Dr., Reston, Va. 22091), Georgia World Congress Center, Atlanta, Ga., Feb. 4-6.

Mini/Micro West, IEEE and ERA (Electronic Conventions Management Inc., 8110 Airport Blvd., Los Angeles, Calif. 90045), Anaheim Hilton Exposition Center, Anaheim, Calif., Feb. 5-7.

Seminars

CAD/CAM, Frost & Sullivan Inc. (Wendy Engelberg, Frost & Sullivan Inc., 106 Fulton St., New York, N.Y. 10038), Cathedral Hill Hotel, San Francisco, Dec. 17-19.

Business Graphics, Frost & Sullivan, Inc. (Wendy Engelberg, Frost & Sullivan, Inc., 106 Fulton St., New York, N.Y. 10038), Cathedral Hill Hotel, San Francisco, Dec. 20-21.

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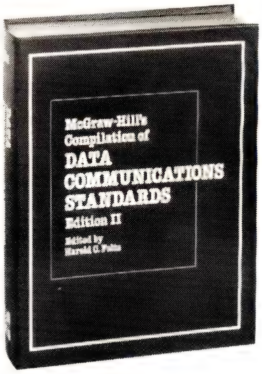

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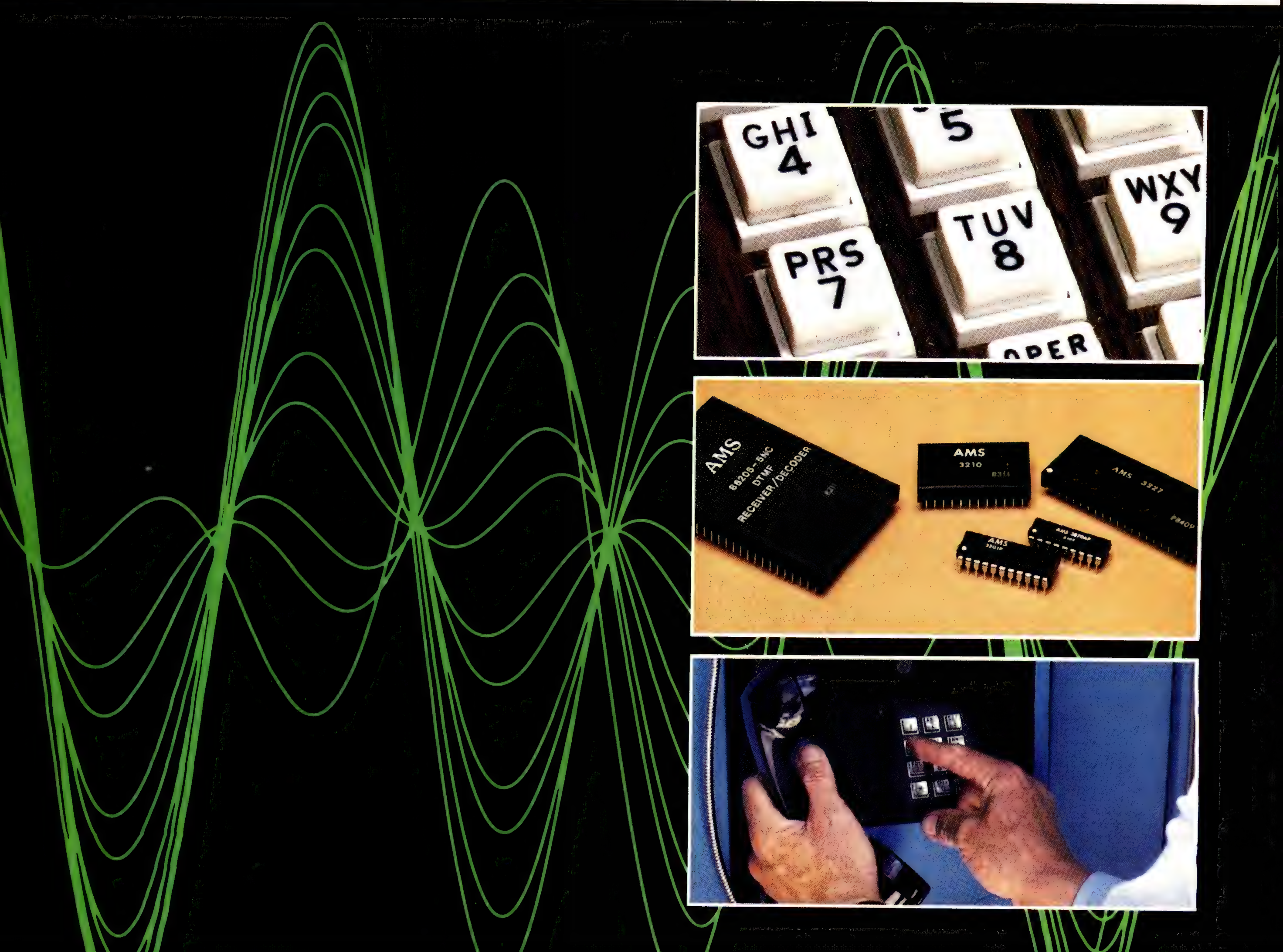

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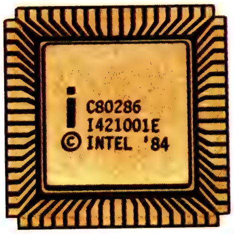

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M68K102C2	As M68K102B2 with 40 MB Winchester
Processor Modules	
MVME101	MC68000 with 256 KB on-board memory space, system controller functions, 1-level bus arbiter, VMEbus interface, parallel I/O, 2 serial I/O ports, timer
MVME110-1	MC68000 with 256 KB on-board memory space, 1-level bus arbiter, VMEbus interface, I/O channel interface, 1 serial I/O port, timer
MVME115M	MC68010 with MC68451 192 Kbytes on board memory
MVME120	MC68010, MC68451, 64 Kbytes ROM area. 128 Kbytes dual ported RAM, 4 Kbytes Cache
MVME121	As MVME120 but with 512 Kbytes RAM
MVME128	MC68010/MC68451, 256 Kbytes dual ported RAM VMXbus interface
Memory Modules	
MVME201	256 Kbytes dynamic RAM with parity
MVME202	512 Kbytes dynamic RAM with parity
MVME222-1	1 Mbyte dynamic RAM with parity
MVME222-2	2 Mbytes dynamic RAM with parity
MVME211	1 Mbyte static CMOS RAM/ROM/ EPROM module
System Controllers	
MVME025	VME system controller
MVME050	VME system controller with memory and I/O

PRODUCT REFERENCE	DESCRIPTION
Peripheral I/O (VMEbus)	
MVME300	IEEE-488 GPIB controller with DMA
MVME310	Universal intelligent Peripheral Controller (UIPC) with free user area
MVME315	Intelligent floppy disk controller and SASI/SCSI interface with DMA
MVME316	VMEbus to I/O channel adapter
MVME319	Floppy disk controller and SASI tape controller interface
MVME320	Winchester/Floppy disk controller
MVME330-UX	Ethernet controller module with UNIX S/W
MVME330-VX	Ethernet controller module with VERSAdos S/W
MVME331	6-Channel intelligent serial communications module
MVME333	4-Channel intelligent high speed communications module
MVME340	64-bit parallel interface module
Peripheral I/O (I/O Channel)	
MVME400	Dual-Channel serial I/O
MVME410	Dual-Channel 16-bit parallel I/O
MVME420	SASI peripheral adapter
MVME435	Buffered 9-track magnetic tape adapter
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CMOS GATES KEY TO 'AFFORDABLE' SUPERCOMPUTER

New class of 64-bit computer runs at 60 megaflops, but Fortran compiler makes it look like a superminicomputer to user ☐ *by J. Robert Lineback*

Richardson, Texas

The official designation is simply C-1. But the hardware that carries the label is nothing less than a $495,000 machine that packs the wallop of a 64-bit Cray 1 architecture. The new machine—made up of multiple asynchronous dedicated processor boards, some of them built around low-power CMOS gate arrays—is billed as the "world's first affordable supercomputer" by its maker, two-year-old Convex Computer Corp.

Actually, the Convex C-1 system has one fourth the peak power of the most powerful supercomputers. But at 60 million floating-point operations per second, it runs 20 times as fast as what are known as superminicomputers. Convex officials believe the C-1 represents a new class of 64-bit computers that will fill the gap between 32-bit superminicomputers and existing 64-bit machines, and thus change the way modern industries use supercomputers in research and product development.

Computer know-how. Unlike other big-league supercomputers, Convex's C-1 can tap the vast reservoir of programs and know-how acquired by users of superminicomputers. Notably, it uses a powerful Fortran compiler to directly speed up existing VAX software. The new compiler automatically determines which portions of a minicomputer scalar program can be reformatted for vector processing in the supercomputer environment (see "Compiler eases move to 64 bits," p. 19).

Supercomputers, which Seymour Cray pioneered in 1976 with the Cray 1, integrate 64-bit vector and scalar processing techniques into one powerful system. But few of today's programmers are familiar with supercomputer environments because of these systems' hefty price tags—ranging from $5 million to $20 million.

Cool it. In addition, conventional supercomputers are based on speedy, power-consuming circuits (often emitter-coupled logic) and so need elaborate cooling systems to keep them percolating along at rates of 240 megaflops. About half of the Convex system, by contrast, is made of CMOS, and a fully loaded C-1 consumes only 3,200 W.

"We have the opportunity to bring supercomputers to the technical masses," proclaims Robert J. Paluck, president of Convex, located in the Dallas suburb of Richardson. With affordable, low-power 64-bit systems, Convex officials say, product-development cycles will be shortened dramatically across a wide range of industries, including electronics, aerospace, chemical, defense, and automotive fields.

So Paluck believes his market could explode as corporations strive to cut computer costs for complex product simulation, modeling, and testing. "The potential could reach $3 billion to $4 billion in as little as

Number cruncher. It looks like a superminicomputer, but the $495,000 Convex C-1 has 64-bit architecture and performs like a supercomputer, running at 60 megaflops.

three to four years," he says, adding that Convex could have halved its own development cycle if it had had a C-1 to work with.

A full 64-bit asynchronous multiprocessing structure lies at the heart of the single-instruction, multiple-data machine. It was conceived by system architect Steven J. Wallach, vice president of technology, who along with Paluck cofounded Convex. (Originally, the firm was called Parsec Systems Corp. [*Electronics,* Oct. 6, 1982, p. 14].)

Brisk sales seen. About 15 months after the firm was launched, Convex had its engineering prototype C-1 running. Today, it has made deliveries of two beta-test-site units—one to chip-maker Mostek Corp., in nearby Carrollton, and a second to an undisclosed in-state oil-exploration operation. In two years, Convex expects to be shipping enough products to reach $100 million.

"One of the strategic advantages Convex had in getting the needed performance out of the CMOS gate arrays was that we had actual semiconductor engineers, as opposed to standard logic-board designers, doing the gate-array layouts," explains Paluck, who was vice president of product development at Mostek before the start of the firm. "If you do not understand the underlying activities of silicon with regard to layout, certain timing delays, and interactions, you encumber yourself with slower parts and cannot fit in as many functions into a given space."

The Convex system comprises three basic subsystems: a highly pipelined, parallel seven-board central processing unit; a memory system that has a controller and up to 128 megabytes of dynamic random-access memory (16 megabytes per card); and intelligent input/output processor modules, based on 10-MHz 68000 microprocessors and their own operating system. The system has a 100-ns major clock cycle as well as a second 50-ns minor clock.

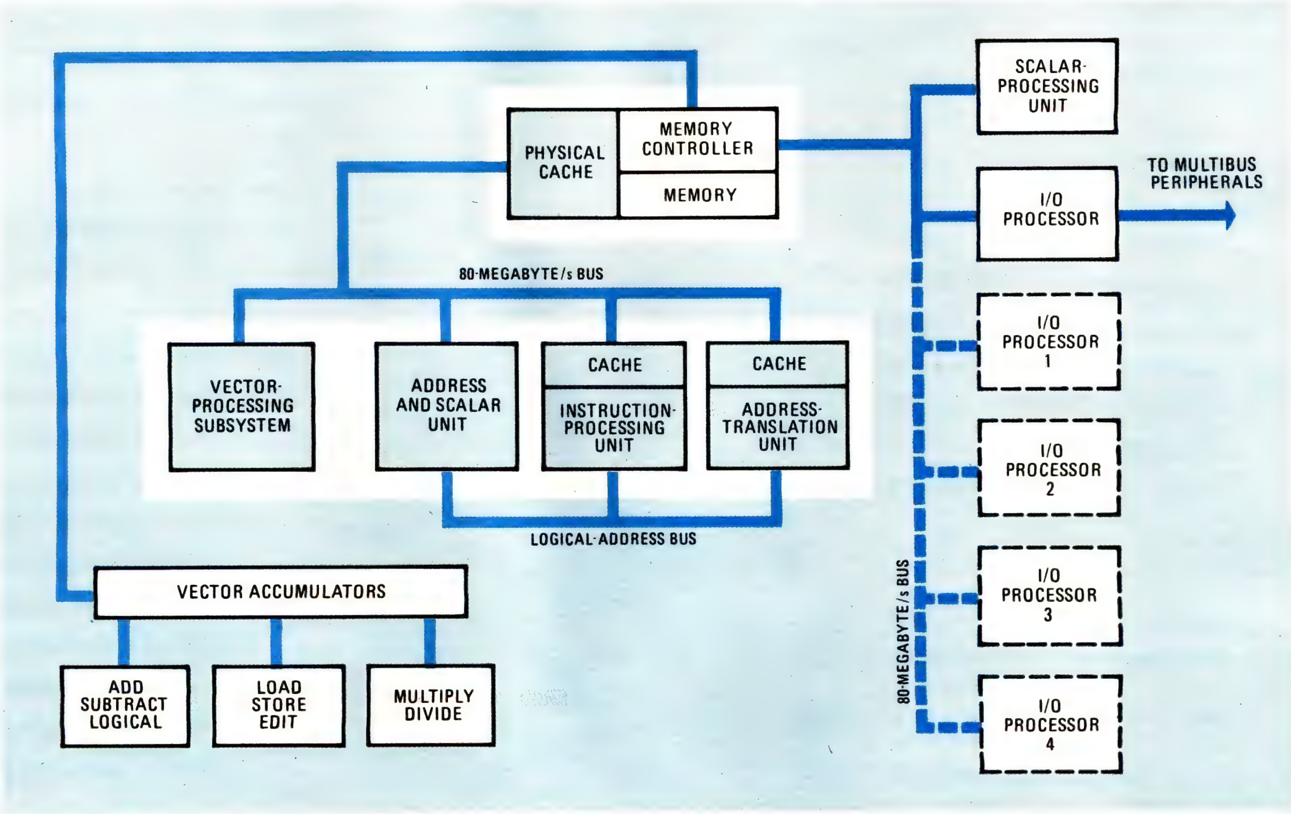
As many as five independent I/O processors—each with the power of a Digital Equipment Corp. VAX 750 minicomputer—can reside inside a C-1 chassis. The units handle data rates of 80 megabytes/s. Each I/O processor can support up to four Multibus card cages—each cage having up to eight controllers—for a total of 160 Multibus controllers packed into the C-1.

The central processing unit runs on two 64-bit buses—one for source and another for destination. The CPU consists of five asymmetrical parallel processors: physical-cache unit, address-translation unit, instruction-processing unit, address and scalar unit, and vector-processing system (see diagram).

Key innovations. The C-1's pipelining, concurrent nature also extends deep into the vector-processing system, which includes a number of key innovations. Two of the three boards that make up the system, in fact, are where Convex's gate-array handiwork paid off.

Two dozen CMOS 8,000-gate logic arrays from Fujitsu Ltd., Kawasaki, Japan, eliminate an additional 12 vector-processing boards that otherwise would have been necessary. Five basic logic designs were implemented in the 2.5-µm CMOS arrays, which handle vector-processing functional units such as add, subtract, multiply, and divide.

Each complex gate-array design



Powerful trio. Three highly parallel subsystems make up the Convex C-1 supercomputer: a central processing unit made up of seven 20-by-20-in. boards; a memory system with a controller and up to 128-megabytes of dynamic random-access memory; and up to five intelligent input/ouput processor modules, based on 10-MHz 68000 microprocessors. The 64-bit data buses run at 80 megabytes/s.

took nine months to complete, and all 179-pin circuits were 100% functional when delivered, recalls Paluck. The rest of the CPU logic was implemented with standard off-the-shelf Fairchild Advanced Schottky TTL.

A basic C-1 system includes two 19-in. racks with the system processor and 4 megabytes of memory, one I/O processor, a service processor, 414 megabytes of formatted Winchester disk storage, a 6,250-b/s tape drive and a Multibus I/O chassis. The system also includes Convex's automatically optimizing, vectorizing Fortran compiler as well as a C language compiler. Volume shipments are slated to begin early in 1985.

Compiler eases move to 64 bits

The highly pipelined, concurrent-processing hardware of the new C-1 from Convex Computer Corp. is only part of a parallel development effort aimed at bridging the gap between 32-bit superminicomputers and 64-bit supercomputers. Convex's software-based Fortran 77 compiler is expected to play a key role in speeding up the migration of VAX users and programs to the supercomputer environment by automatically optimizing and vectorizing data for the powerful features of a Cray 1-like architecture. All the user sees is faster execution of programs, promises Convex.

"We are providing the overall performance of a supercomputer, but with the interactivity and software of the superminis," says Robert J. Paluck, the firm's president. To Convex, it is the best of both mini- and supercomputer worlds. Exploiting the C-1's Cray-like architecture, veteran supercomputer programmers can apply their experience with speed-enhancing algorithms to boost software performance. For minicomputer software engineers, who greatly outnumber their supercomputer counterparts, familiar programming techniques can readily be applied to the C-1 supercomputer—the proprietary compiler automatically prepares data files for vector processing. Paluck believes that the vectorizing compiler will be a boon for third-party software houses interested in serving the emerging supercomputer hardware markets.

The compiler scans Fortran 77 and VAX/VMS Fortran software code looking for opportunities to reformat data for high-speed execution by the C-1's pipelined vector-processing system. "The software compiler applies factors-of-merit algorithms to the standard Fortran code to determine the best way to optimize it for the C-1 vector and scalar processing hardware," explains Steve J. Wallach, vice president of technology.

In addition to the vectorizing Fortran compiler, Convex offers a C language compiler. The firm is also working on C-1 supercomputer compilers for the Pascal and Ada languages. —J.R.L.

WAFER TECHNOLOGY

LASERS SHOW DEFECTS BELOW WAFER SURFACE

Dayton, Ohio—As semiconductor devices move toward submicrometer geometries, the emphasis in electronics materials is on smoother semiconductor wafer surfaces. Already, premium wafers can be had with surface variations specified at 3 μm maximum for 100-mm wafers and 4 μm for 125-mm sizes. But Robert V. Silva, president of VTI Inc., a small firm here, contends that to really increase device yield with fine-line geometries, you have to go below the wafer surface.

What manufacturers have to be on the lookout for, says Silva, is mechanical subsurface damage caused by the sawing and polishing techniques used in wafer production. He stresses that even though the surface is smooth, the wafer subsurface can be damaged by saw vibration when it is sliced from the ingot.

In addition, improper polishing techniques can actually push the damage deeper into the substrate or leave subsurface tracks from the abrasive materials that are used in the polishing compound. The problem is particularly nettlesome with gallium arsenide: some manufacturers have reported crystal damage extending through the wafer's entire thickness.

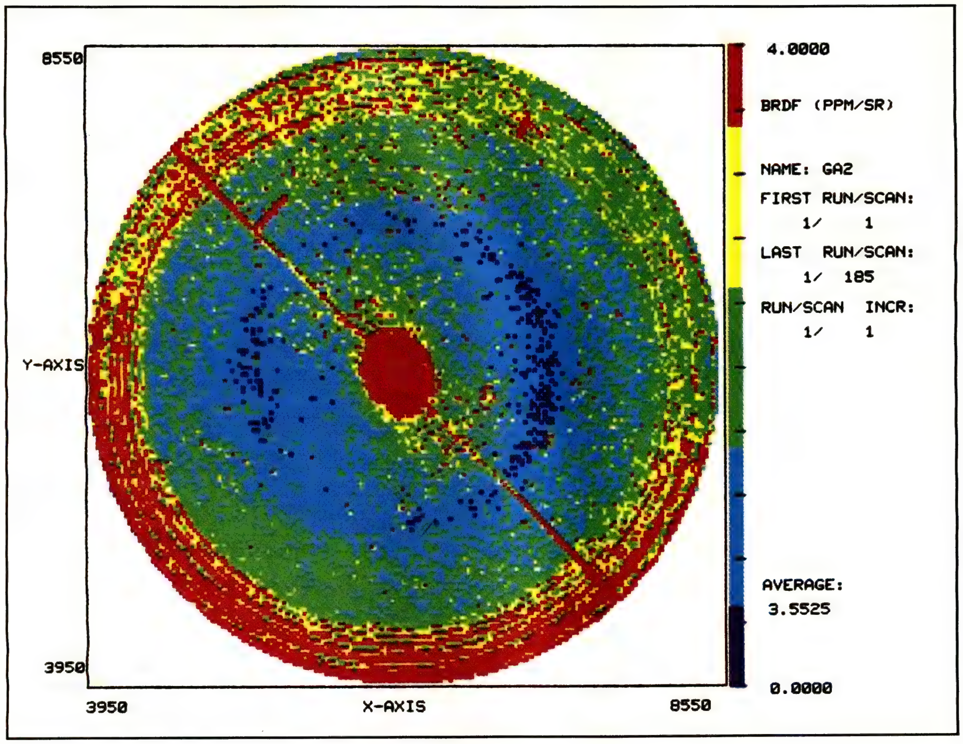
Gentle lasers. Until now, processing wafers that were damaged in this way was considered unavoidable because the damage could not be detected without destroying the wafer. But VTI says it has a solution, based on years of work in its specialty, which is building supersmooth optical surfaces for ring-laser gyros and other precision gear.

The eight-year-old firm has come up with a laser-based measuring technique that can also be used on semiconductor wafers. Not only does the VTI technique measure surface smoothness, but it also allows detection of mechanically induced subsurface crystal damage without harming the wafer. Thus wafers could be graded for quality or processed only on good portions.

The detection technique—which VTI has dubbed photon back scatter—is based on the measurement of light scatter that occurs when a 5-mW helium-neon laser at 632.8 nm is focused to a 0.25-mm spot size and directed at an angle to the wafer surface.

When used on conventional quartz or glass optical materials, the technique measures scatter from the surface. But applied to semiconductors such as silicon and gallium arsenide, the beam penetrates the material so that the measured scatter can be used to spot subsurface defects. To date, tests have shown the technique to be effective in spotting wafer damage to depths of at least 5,000 Å, Silva says.

Color coded. Operating under computer control, the VTI instrument measures the scatter resulting from about 140,000 data points on a 4-in. wafer. It converts the data to a bidirectional reflectance distribution (BRDF) measured in parts per million per steradian. This information



Best where hue is blue. In VTI's wafer-inspection technique, backscatter from some 140,000 data points on a 4-in. wafer is processed to obtain a pseudo-colored plot of the bidirectional reflectance that shows the extent of subsurface damage. On VTI's scale, blue areas have the least damage.

is then used to produce a plot of the wafer that is color-keyed to the BRDF values, resulting in a scatter map that shows areas of subsurface damage by degree (see color plot).

On the VTI color scale, blue areas are those exhibiting the least scatter, hence the least damage, and should be useful for fabricating small linewidth circuitry. By contrast, the high-scatter red areas at the other end of the scale indicate areas of high subsurface damage on which fabrication of fine-line geometries, say, below 1 to 1.5 μm, should not be attempted.

"It turns out that damage just below the surface is terribly critical to yield," Silva contends. "And the problem gets worse and worse as the [circuit] dimensions get smaller."

Some industry sources aren't so sure of the correlation. "The VTI method appears to be a reasonable nondestructive mapping technique for detection of shallow subsurface damage," observes Thomas J. Magee, manager of semiconductor processing at XMR Inc., a Santa Clara, Calif., firm that deals in laser-based materials and semiconductor processing techniques. He adds that it is reasonable to expect that mechanically caused subsurface wafer damage—which typically extends to depths of below 1 μm—could cause difficulties with fine-geometry device yields.

"But it's something you can't quite isolate yet to show that it really is a problem," Magee says. "Even in VHSIC [the Very High-Speed Integrated Circuits program sponsored by the Department of Defense], not all the answers are in yet."

"Subsurface damage, though interesting, is going to take a considerable amount of time to relate to VLSI yield," says Martin C. Peckarer, who coordinates contract awards for VHSIC strategic material improvement at the Naval Research Laboratory in Washington, D.C. VTI was one of four contractors awarded materials-related VHSIC contracts last fall.

The DOD is now considering whether to provide more funding to VTI, which has used up the $85,000 in its original eight-month contract, according to Peckarer. Other contractors, including Texas Instruments, Hughes Aircraft, and Westinghouse, still have another year to run on their two-year contracts.

High hopes. Despite some in the industry who are skeptical, the VTI technique is drawing interest. "I haven't run any experiments with them to verify their [VTI's] claims, but what they're talking about seems to be perfectly possible," says Robert M. Perchak, a senior engineer at NCR Corp.'s Quality Engineering

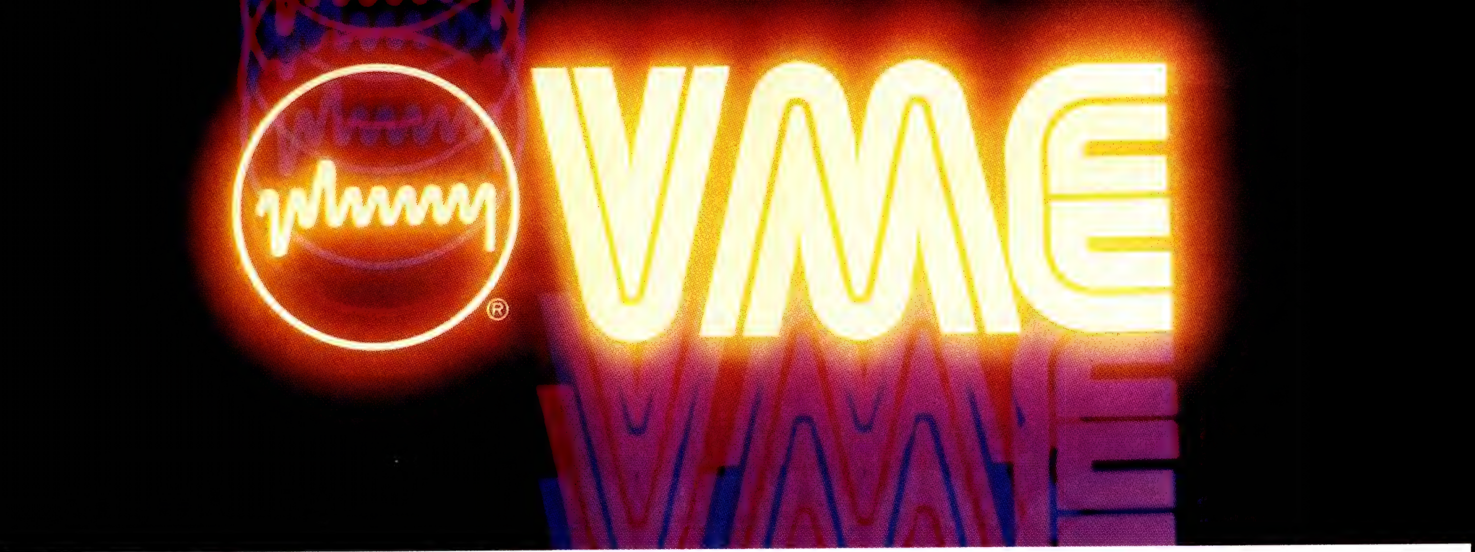
The search for high-quality wafers

VTI Inc. isn't the only firm hoping to break into the high-quality wafer-processing business. Aracor Inc., a Sunnyvale, Calif., research and development firm supported with government funds, has a similar plan based on a proprietary wafer-polishing technique that it says can be used to get rid of mechanically caused subsurface wafer damage.

Unlike conventional methods in which the polishing pad is in actual contact with the wafer, Aracor's method relies on noncontact or hydroplane polishing, whereby a thin film of fluid separates the pad from the wafer. Specially designed instrumentation is used for precise control of the gap to within ±1 mil. The result, says Charles S. Leung, assistant manager at Aracor, is a system that can be used to polish away wafer layers containing damage under the surface while maintaining surface smoothness—an ability not possible with conventional polishing techniques.

Aracor is currently involved in negotiations with Spectrum Technology Inc., a Holliston, Mass., crystal producer, aimed at producing extremely high-quality gallium arsenide wafers for use in Department of Defense programs. A method such as VTI's subsurface-damage-detection technique could be useful in this sort of effort, Leung notes, since other delineation techniques to determine depth of the damage require destruction of the wafer.

–W.R.I.



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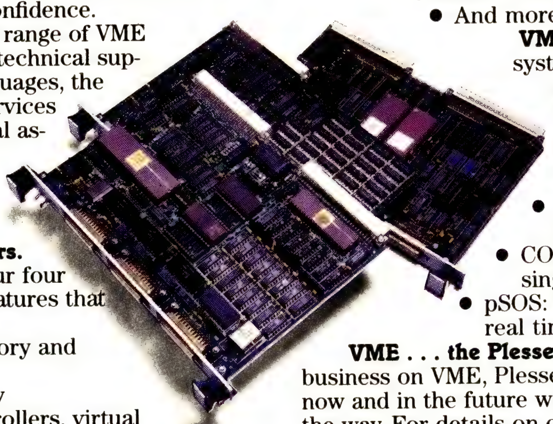

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Group in Miamisburg, Ohio. "And when you're trying to get speed out of products and to manufacture transistors down at the 1- to 2-micron level, crystal damage starts to become very important to yield."

For its part, VTI is trying to attract about $5 million in funding from one or more semiconductor manufacturers to set up a pilot line for the production of supersmooth GaAs wafers using VTI technology. Besides the subsurface-damage-detection technique, the firm also has a proprietary wafer-sawing and polishing method known as MagnaSmooth that it would use in conjunction with the detection method to turn out the wafers. The idea is to use the detection scheme as a guide in further refining the wafer-production technique so as to eliminate the effects of mechanical subsurface damage.

Though the firm might do some silicon work, VTI plans to focus on GaAs because its wafer-damage problems are more severe than silicon's. Also, the company does not want to go head to head with large silicon production houses such as Monsanto.

The VTI method currently requires about 1½ hours to produce a single wafer-damage map. But Silva believes that modifications, such as reducing the number of data points taken, could lead to a production throughput rate of about 40 high-quality wafers per hour."If we can find somebody who can understand our data and who can [provide funding to] help us get a pilot line up, I think we can make silicon and gallium arsenide wafers such as the world has never seen before," declares Silva. **–Wesley R. Iversen**

OPTOELECTRONICS

400-MB/S SYSTEM NESTLES ON TWO CHIPS

Kawasaki, Japan—It took a while, but an eight-year, $73 million project on optical measurement and control systems begun by Japan's Ministry of International Trade and Industry in March 1979 has begun to show prototypes for practical products. Fujitsu Ltd. has developed high-speed modules for 400-Mb/s optical-fiber systems that include a laser transmitter with its driver circuits on one monolithic optoelectronic integrated circuit and a photodiode receiver with its preamplifier on another.

Teruo Sakurai, manager of Fujitsu's Advanced Optoelectronic Devices Engineering Department here, claims that the new chip is superior to a previously announced IC from Rockwell [*Electronics,* Oct. 6, 1983, p. 51] because the laser current is so much lower.

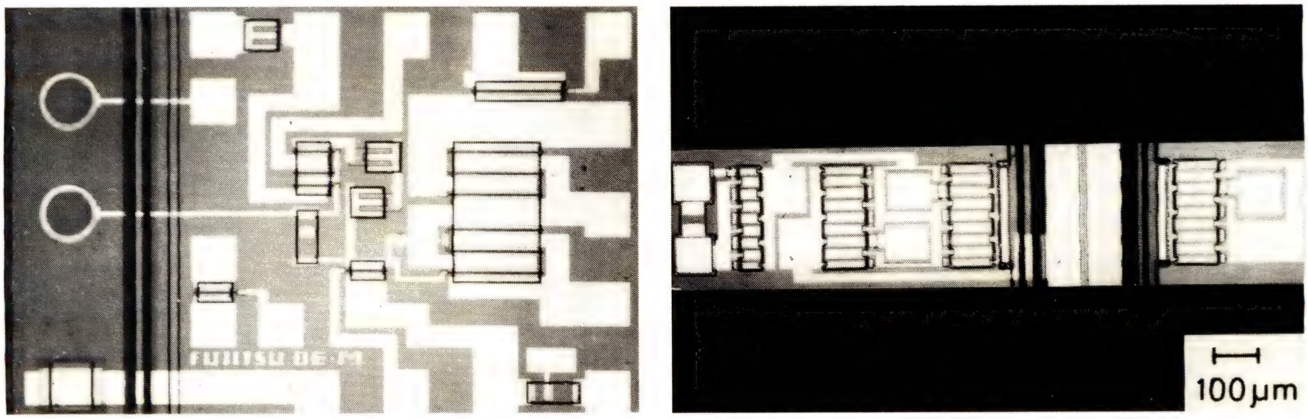
The Fujitsu chip is being fabricated by a molecular-beam epitaxial process because it is part of a national project, according to Sakurai. He adds, however, that it could be made more cheaply by metal organic chemical vapor deposition or by vapor-phase epitaxial processes.

The goal of this work is 500-Mb/s transmission of high-resolution television signals. Though applications of this type of hardware include factory and other industrial control systems, it will be equally suitable for long-distance computer data and voice transmission, local networks, and even home information networks, including cable TV.

New driver. Earlier, Fujitsu engineers developed a transmitter IC featuring a multiquantum well laser with two FET transistors integrated as drivers [*Electronics,* June 30, 1983, p. 89]. This time, they opted for a laser with a graded-index-waveguide separate confinement heterostructure (GRIN-SCH) because its lower threshold current reduces heat generated in both the laser and its drivers. Driver circuits on the chip consist of four FETs and one resistor.

Sakurai says that the threshold current for discrete GRIN-SCH lasers is 10 mA or less—the lowest value to date is 8 mA—and rises to 15 mA when integrated drivers are fabricated on the same chip. Discrete multiquantum well lasers have a minimum threshold current of 15 mA, but when driver transistors are integrated on the same chip, threshold current rises to 20 mA.

Both types of laser are fabricated by a molecular-beam epitaxial process on a semi-insulating gallium arsenide substrate. In the GRIN-SCH structure, there is a single quantum well formed by a 6-nm-thick GaAs



Chip talk. Fujitsu Ltd. has packaged the kingpin elements for a 400-Mb/s optical transmission system on two chips. The transmitter chip (left) carries a laser and a four-FET drive circuit; the receiver has a p-i-n photodiode detector and its preamplifier.

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layer sandwiched between two layers of aluminum gallium arsenide. The percentage of Al in these two layers gradually increases from 0.20 at the junctions to about 0.45 at the far edges of the layers.

Beam confined. The transition of excited electrons in the quantum well's conduction band to the valence band generates the photons needed for laser action. The AlGaAs layers sandwiching the active layer have an index of refraction that decreases with distance from the active layer.

They confine the laser beam to the active layer in the same way that the clad layer in a graded-index optical-fiber waveguide confines transmitted light to the fiber core. What is known as a ridge waveguide runs along the laser's top and prevents the beam from spreading laterally.

Although the laser structure is approximately 2 μm high, its top is kept level with the tops of the driver transistors by cutting a moat with beveled edges in the chip before fabrication of the laser. Driver transistors are fabricated on the lands on either side of the moat.

The chip is extremely narrow—0.3 by 1.4 mm—because of the necessity of cleaving the ends of the laser cavity. Chip width is thus set by laser length. Another method of fabricating the laser cavity's end surfaces will probably have to be developed before it is possible to integrate both the transmitting and receiving portions of the system on a single chip.

Two FETs on the chip form a differential input amplifier that controls laser current. A third FET and the integrated resistor form a current-limiter circuit, while the fourth FET sets the no-signal laser current.

The laser's 0.83-μm output is coupled to a graded-index optical fiber, which has a core diameter of 50 μm and a clad diameter of 125 μm, with a coupling efficiency of about 60%. The short lead length between the integrated driver FETs and the laser serves to reduce stray capacitance. Operation of the circuit at modulating frequencies up to 2 GHz has been confirmed.

The receiver IC incorporates a p-i-n photodiode, six FET transistors, two Schottky level-shifting diodes, and one feedback resistor on a single 1.0-by-1.6-mm chip. The feedback resistor also doubles as the load for the p-i-n photodiode.

The 100-μm-diameter photodiode has a quantum efficiency of close to 80%. Inclusion of its amplifier on the same chip decreases stray capacitance for excellent high-frequency response and also reduces noise pickup. Bandwidth of the receiver IC for 3-dB gain reduction is 300 MHz and good operation is obtained for non-return-to-zero signals at frequencies over 400 MHz. **–Charles L. Cohen**

LEGISLATION ABROAD

JAPAN'S NEW PIRACY BILL IS A TWO-EDGED SWORD

Tokyo—The Japanese government is preparing legislation similar to the bill passed recently by the U.S. Congress that protects semiconductor mask designs from what are known as computer-chip bandits [*ElectronicsWeek,* Oct. 15, 1984, p. 8].

The bill, which is being drawn up by the Ministry of International Trade and Industry, will be virtually identical to the U.S. Semiconductor Protection Act—which is retroactive to July 1983 and extends copyright protection for 10 years to makers of innovative circuit designs. MITI's main concern about the U.S. law is that its retroactive date is relatively recent, so that previous technology disputes between U.S. and Japanese companies would not be reopened.

"The Japanese realize that this legislation is reciprocal, in that it also extends protection inside the U.S. to foreign countries which have similar legislation," says Richard May, who tracks high-technology issues for the U.S. Embassy in Tokyo. "The Japanese also realize that passing their own law will give them some protection." South Korea already looms as a potential market rival to Japan, and Taiwan and Malaysia also are seeking to upgrade their technological capabilities.

Designs revealed. May and other industry sources downplay fears that the Japanese may use the proposed law to unfair advantage. Because the legislation would require the revelation of mask designs to patent authorities, it has been suggested that MITI would be in a position to aid Japanese makers in their efforts to narrow the U.S. lead in sophisticated circuit design.

"Japanese companies have tried before, and usually failed, to copy the most complex integrated circuits," says a U.S. semiconductor executive in Tokyo. "Going the licensing route is much, much easier, and faster."

"As long as the law is consistent with what's been done in the U.S., we're pleased," says John P. Stern, senior representative of the American Electronics Association office here. "But we'll be watching carefully to see if the protection procedure is handled by a neutral, disinterested authority, or whether MITI chooses to act in what it sees as the unilateral interest of advancing Japanese technology."

The Japanese law will be ready in time for the opening of the special Diet session in December. It probably won't be passed until early next year, because more urgent legislative business, including the 1985 fiscal government budget and new telecommunications laws, will come up for action first.

Although MITI seems to be following the U.S. example on semiconductor-design protection, another piece of MITI-inspired legislation that has led to sharp clashes with the U.S.—a software-protection bill—apparently is going to be resubmitted next year. If so, there will be another U.S.-Japan showdown on the issue, since the two countries' basic positions are unchanged.

The U.S. still maintains its position that existing copyright law can adequately cover software protection. But MITI, in an attempt to extend its bureaucratic influence to this key area, continues to insist on an industrial-property patent law concept

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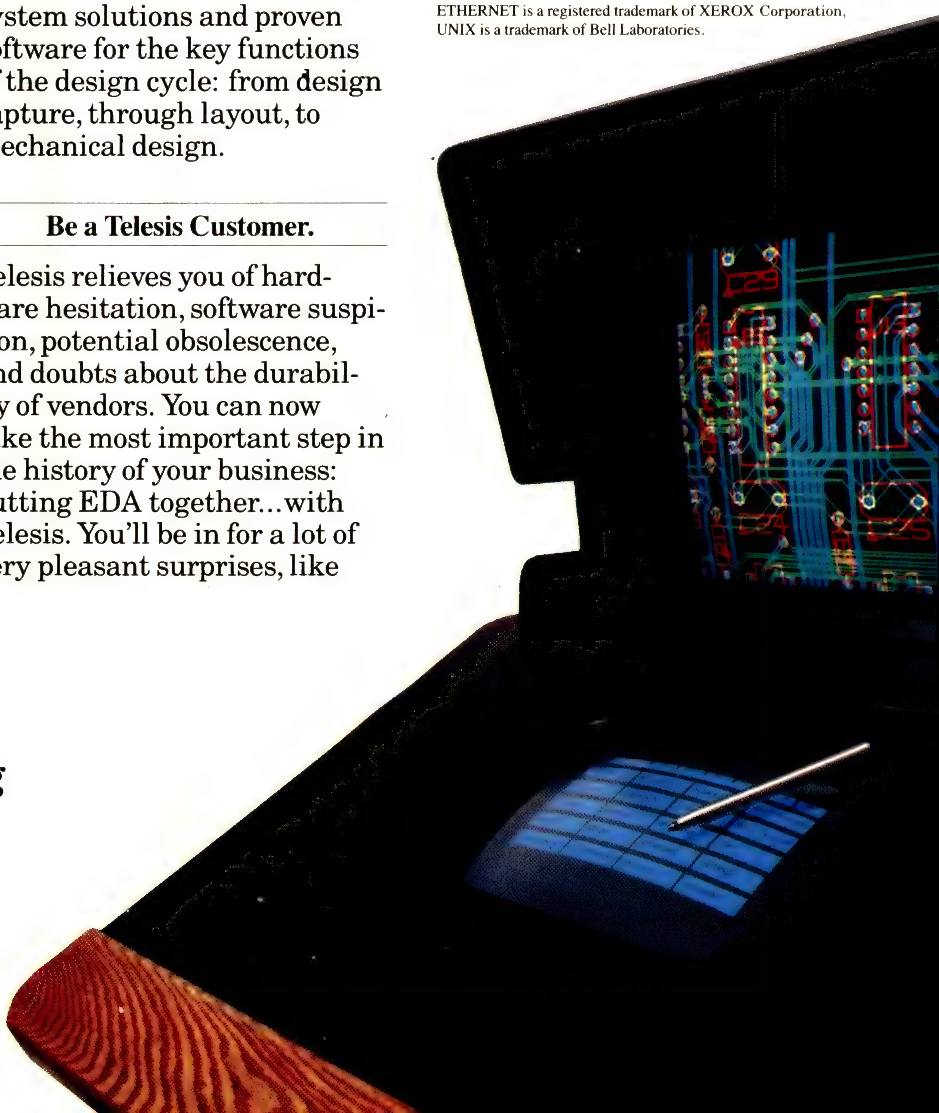

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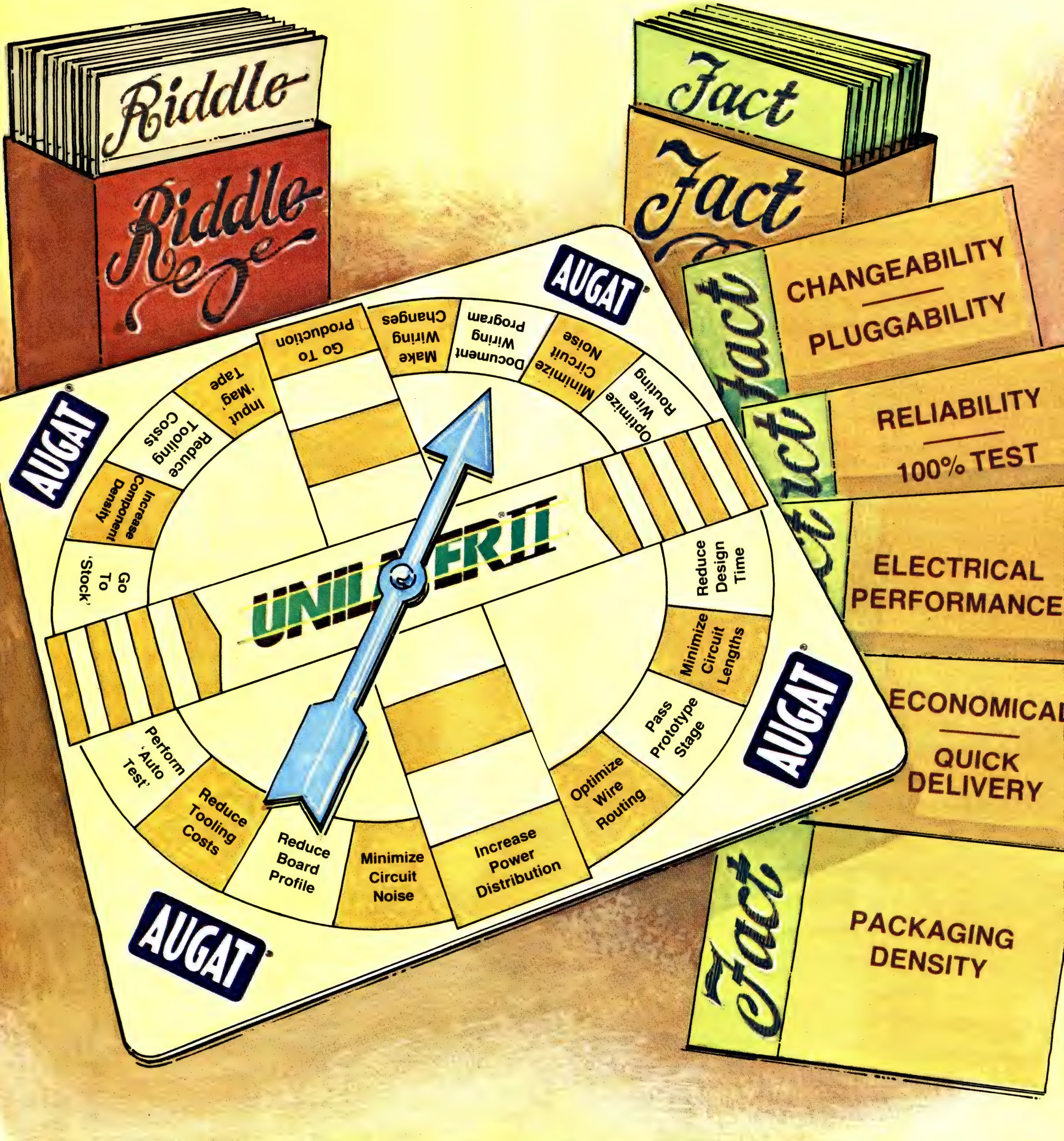

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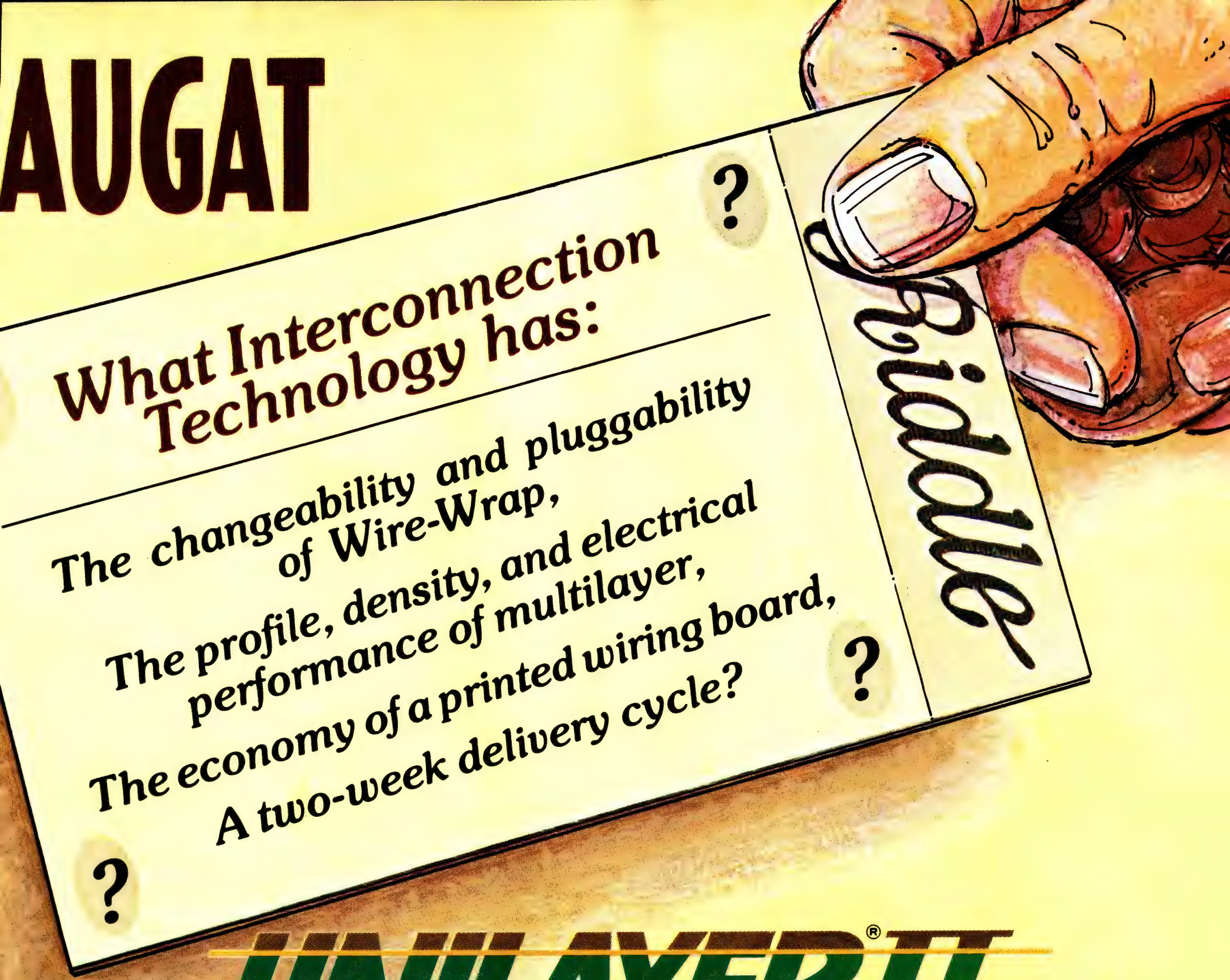

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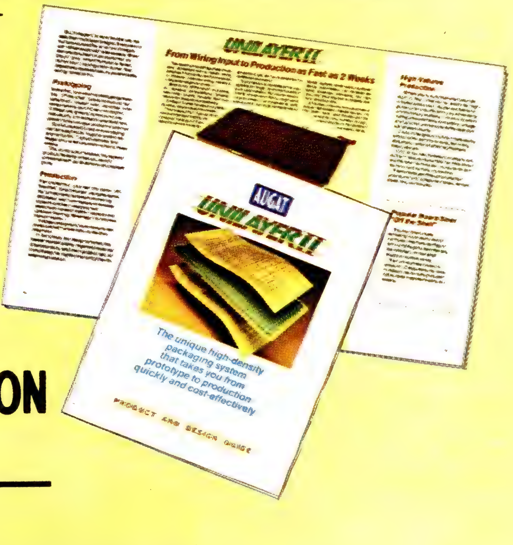
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that includes possible compulsory remarketing of software to third parties, without the permission of the original developer. –**Mike Berger**
McGraw-Hill World News

COMPONENTS

POWER FET PRICES CUT

Phoenix—By most reports, power MOS FETs remain a hot item, one of the few devices whose demand is holding up nicely against a general slowdown in semiconductor orders. But two moves by heavyweight discrete-components supplier Motorola Inc.—long tabbed by insiders as a serious challenger to the market leader, International Rectifier Corp.—are promising to turn up the burner under competitors.

For openers, Motorola's Power Products Division, Phoenix, is unveiling an upgraded MOS FET line, the TMOS III, at Wescon/84 in Anaheim, Calif., this week. But perhaps even more important, with TMOS III Motorola is kicking off the first round of serious price-cutting. This comes as no surprise to its competitors, who have expected the move since early this year [*Electronics,* Feb. 23, 1984, p. 50]. Motorola is offering a 10% saving over any of some 700 devices sold by seven competitors, but it is specifically targeting International Rectifier, in Los Angeles, whose HEXFET line has about half of the market.

Packed in tight. As the third generation of Motorola MOS FETs, these new devices, through fine-line geometry and spacing of source sites, have increased the packing density to more than 1 million cells per square inch, up from 600,000 cells. Because the die can therefore be smaller, the device is less expensive to fabricate, according to Motorola. For example, for ratings up to 200 V, a TMOS III die need be only 70% the size of the original TMOS I part (see diagram). In addition, accompanying improvements in the key on-resistance specification are achieved through the channel's reduced resistance.

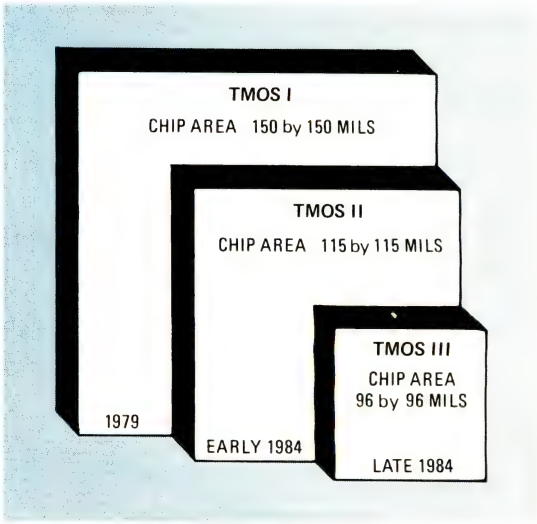
One MOS FET in the series is the MTP3055A, a 12-A, 60-V device with an on-resistance of 0.15 Ω. It replaces the industry-standard bipolar transistor, 2N3055, whose on-resistance is 0.3 Ω. Motorola touts the new MOS FET as the lowest-priced in the industry: 60¢ in small quantities and 50¢ in 10,000-unit orders.

Ready for action. For firms facing a Motorola product offensive, officials at International Rectifier and Siliconix Inc. (with Motorola, the top three in MOS FETs) seem to be looking forward to stepped-up action. Arthur E. Fury, vice president for marketing at Siliconix, Santa Clara, Calif., even believes that Motorola's price drop helps MOS FETs establish their advantages even more strongly against bipolar devices. "Price is no longer a deterrent, now that MOS is as cheap as bipolar," he says.

International Rectifier's Derek Lidow, vice president for operations, sees the price dropping further by March, before stabilizing for about a year. "So the Motorola move is not as aggressive as it looks," he adds, noting that RCA Corp.'s MOS FET prices already are lower than the Motorola target, but RCA has not been able to buy market share. As for TMOS III's performance, both officials note that the new Motorola devices only match that of products both firms have already brought out.

The power FET forecast for 1984 is a doubling of sales—to about $130 million worldwide. Thus 1984 marks the fourth straight year of 100% growth, surpassing the most optimistic projections, which looked for less than $100 million in sales. Says Siliconix' Fury, "It is clear this market is accelerating faster than anybody thought." –**Larry Waller**

Shrinking die. Underlying Motorola's round of price cuts for its TMOS power MOS FETs is better technology that makes for smaller dice—and lower production costs.



INTERNATIONAL BUSINESS

SIEMENS MOUNTS CAMPAIGN TO BOOST ITS IC RANKING

Regensburg, West Germany—Siemens AG, for all its clout in the systems business, is an also-ran in integrated circuits, at least by U.S. and Japanese standards. This is true despite its long tradition in semiconductors, its strength on the home market, and the technical excellence of many of its products.

On the world's chip market, the West German company ranked 21st in sales last year, and even in Europe it was only in sixth place among IC suppliers, according to Dataquest Inc., the San Jose, Calif., market research firm.

For Siemens, West Germany's No. 1 electronics producer and industrial pride and joy, this state of affairs has become intolerable. "It cannot keep going on like this," says Hermann R. Franz, a member of the Siemens board of management and, since Oct. 1, president of the company's $1 billion Components Group. "We must catch up in the high-technology circuits field."

Thus, concerned over the U.S. and Japanese lead and recognizing that a stronger in-house chip-making capability is crucial to its systems business, Siemens has launched a development project that dwarfs most others the company has carried out in its 137-year history. From now through 1989, the firm will spend some $860 million to develop ICs in micrometer and submicrometer technology. Its lead products will be 1- and 4-Mb memory chips.

Megabucks. Of the total amount dished out for what Siemens appropriately calls its Mega project, roughly $130 million is slated for a production plant here, for which company officials laid the cornerstone on Oct. 12. In this medieval Bavarian town, about 65 miles north of Munich, volume production of 1-Mb dynamic random-access memory chips will get under way by 1987.

In addition, the firm will set aside an as yet undetermined sum for a 4-Mb DRAM factory, also to be located in Regensburg. It has earmarked another $176 million for a facility for the development of 1-Mb RAMs at the Siemens research center in Perlach, a Munich suburb.

What's more, in a rare display of European togetherness, Siemens and Philips, the Netherlands, will cooperate on the development of 1-Mb static RAMs, which the Dutch firm will produce, and on 4-Mb DRAMs, which the German firm will make at its Regensburg plant starting in 1989. The work will also include the development of a common CMOS technology and related computer-aided design techniques.

For this German-Dutch development effort, which will be carried out at the Philips facilities in Eindhoven, the two firms will invest around $530 million during the next five years. Both the German and the Dutch governments say they will contribute to this effort—Bonn's Ministry for Research and Technology with roughly $120 million and Holland's Economic Affairs Ministry with $68 million.

In advanced IC development, the pooling of resources by powerful European contenders seems crucial to success. "West Germany alone can-

News briefs

Ex-Mostek leaders back new Austin chip house

With many electronics firms locating new operations in central Texas, it was just a matter of time before Austin got a new start-up in MOS integrated-circuit markets. It's happened in the form of Crystal Semiconductor Corp., a new CMOS integrator of digital and linear circuits that is partly backed by former executives of Mostek Corp., Carrollton, Texas.

Investors include Mostek founder and former chairman L.J. Sevin, who left in 1981; Charles (Vin) Prothro, who succeeded Sevin before departing in early 1982; and Harvey (Berry) Cash, ex-vice president of marketing, who left in December 1981. Crystal's technical leadership comes from founder Mike Callahan, a former Mostek engineer who led that firm's thrust into telecommunications chip markets during the 1970s.

The nucleus of Crystal Semiconductor is Callahan's five-year-old circuit-design-service house, Texas Micro Engineering in Austin. Callahan will be vice president of technology at the new firm. The president is James Clardy, recently departed vice president of manufacturing at Harris Corp., Melbourne, Fla. According to Crystal chairman Cash, a half dozen investors have pumped between $5 million and $10 million into the new firm, which plans to combine linear and digital circuits in high-performance monolithic components. Its market will include analog-to-digital interfaces, telecom circuits, and semicustom digital gate arrays with on-chip linear functions, such as operational amplifiers.

Kodak brings out new floppy-disk entrants

Eastman Kodak Co. last week enlarged the scope of its magnetic-medium-products business with the introduction of a line of high-density floppy disks and the formation of a manufacturing division to produce them [*Electronics-Week*, Oct. 8, 1984, p. 52]. The Rochester, N.Y., firm, which recently entered the video-tape market, now addresses the nearly $2 billion-a-year worldwide floppy-disk market with 8-, 5¼-, and 3½-in. disk formats. In addition to a 300-Oe line, an array of high-density, 600-Oe, 5¼-in. disks provides 3.3 megabytes of formatted storage capacity. Prices per disk range from $3.85 to $16.50 with immediate availability in the U.S. As talks continue with Mexican government officials for the construction of a finishing plant in Guadalajara, Kodak officials say coated and die-cut disk "cookies" will be produced in Rochester.

CAD/CAM/CAE market to boom this year

The push by companies to automate more manufacturing operations in order to increase productivity, coupled with new product offerings from vendors, has given the computer-aided design, manufacturing, and engineering market an additional boost. As a result, the CAD/CAM/CAE market this year should reach $2.8 billion, up 52% from 1983's market of about $1.8 billion, says a new study by Daratech Inc., Cambridge, Mass. The 1984 growth rate comes after a gain of 40% in 1983 and a 28% rise in 1982. "Aiding this growth are the CAE/CAD specialty vendors, whose sales of electronic-circuit design systems are projected to grow 180% in 1984 and account for 8% of total industry revenues," the report notes. Two of the largest vendors in this market—Computervision Corp. and IBM Corp.—are set to offer systems based on personal computers, it says. The research firm sees revenues for this segment of the market, which includes systems for mechanical and architectural drafting, solids modeling, and electronic-circuit analysis and layout, hitting $40 million this year.

Engineering work station firm's business triples

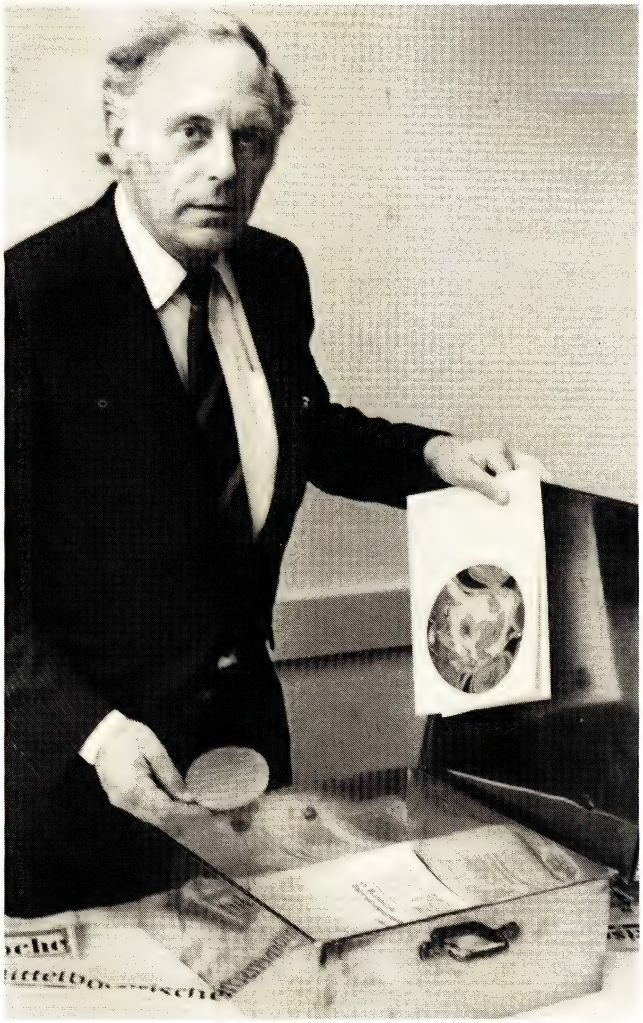
As proof of the strength of the market for engineering work station equipment, Mentor Graphics Corp., Beaverton, Ore., reported that its sales and earnings for the third quarter of 1984 more than tripled from last year. In the third quarter, Mentor Graphics earned $2.4 million on sales of $24.2 million versus a profit in last year's third quarter of $419,000 on sales of $7.9 million.

not stand up to the rest of the world. We must go together with a company like Philips in high-density chip development," says Franz. "We are sure we will succeed."

Independent market watchers think so, too. "If any two European companies can make it, it is Philips and Siemens together," is the comment from a German electronics analyst. The two cash-heavy firms are Europe's No. 1 and No. 2 electronics producers, respectively.

"The two companies have a very good chance of succeeding," says Adrian Tarr, associate director of the European Semiconductor Industry Service of Dataquest, in London. Siemens has demonstrated its capability in 256-K memory-chip development and Philips its strength in high-density logic circuits, he adds. "So it seems sensible for the two firms to pool their resources and share the development costs."

The Mega project's heavy emphasis on memories is based on Siemens' belief that such chips are technology drivers. "Components like 1-Mb RAMs are lead products," Franz says. "They will open the door to follow-up products, particularly application-specific ICs, microcomputer parts, and logic circuits of all kinds. Furthermore, memories will continue to be one of the hottest-selling items for some time to come," he states.



Positioned. Hermann R. Franz, Components Group president, says a strong position in microelectronics is crucial if Siemens is to become a world player.

The heavy infusion of money into memory research and development, as well as the cooperation with Philips, is expected to propel Siemens to the forefront in semiconductor technology. "By the end of this decade we hope to be a major force on the world's market and rank among the top 10 chip suppliers," says Jürgen Knorr, vice president in charge of semiconductor manufacturing and product development in Siemens's Components Group, Munich.

"Our efforts in microelectronics, however, amount to more than just a race to catch up," he comments. "Our commitment is a down payment on the challenges ahead—on the office of the future, the factory of the future, and the networks of the future."

In all these areas, Siemens is determined to become a significant player on the world scene. "For that, a strong position in microelectronics is crucial," Knorr says. **–John Gosch**

TELEVISION

THOMSON EYES FRENCH DIGITAL TV MARKET

Saint-Egrève, France—A flurry of publicity has surrounded the launch of Intermetall GmbH's Digit 2000 chip set for digital TV. In fact, some people are convinced that the ITT Semiconductors Group lead house has already won the battle to supply integrated circuits for the next generation of sets.

"Not quite," say executives at Thomson-CSF's Bipolar Integrated Circuit Division. Indeed, a largely digital multistandard chip set is being touted by Thomson as the design of choice for achieving low fabrication costs as well as performance superior to analog [*ElectronicsWeek,* Aug. 13, 1984, p. 49]. What's more, they expect manufacturers of TVs for the French Secam standard to underpin Thomson's share of the market.

Competitive. The French company's optimism rests on several factors. First, TV sets based on the Digit 2000 are still unavailable outside West Germany—even though ITT's Consumer Products Division has been marketing sets for more than a year. Second, manufacturers that plan to use the ITT chip set have it tagged for very high-end receivers, where its market penetration will be minimal. Third, there is still no sign of Secam capability in the Digit 2000 [*Electronics,* Feb. 23, 1984, p. 63], even though Intermetall claims to have had such a circuit in full production since this past summer.

"I've had a private presentation on digital TV by ITT because I had heard of the set from a German colleague and asked for more information," points out the purchasing manager of one of France's largest retail appliance chains. "But for the moment, there is absolutely no marketing effort to promote it in the trade. Given the usual delays between wholesale launch and retail availability, the most optimistic scenario would have it in the shops no earlier than the end of next year."

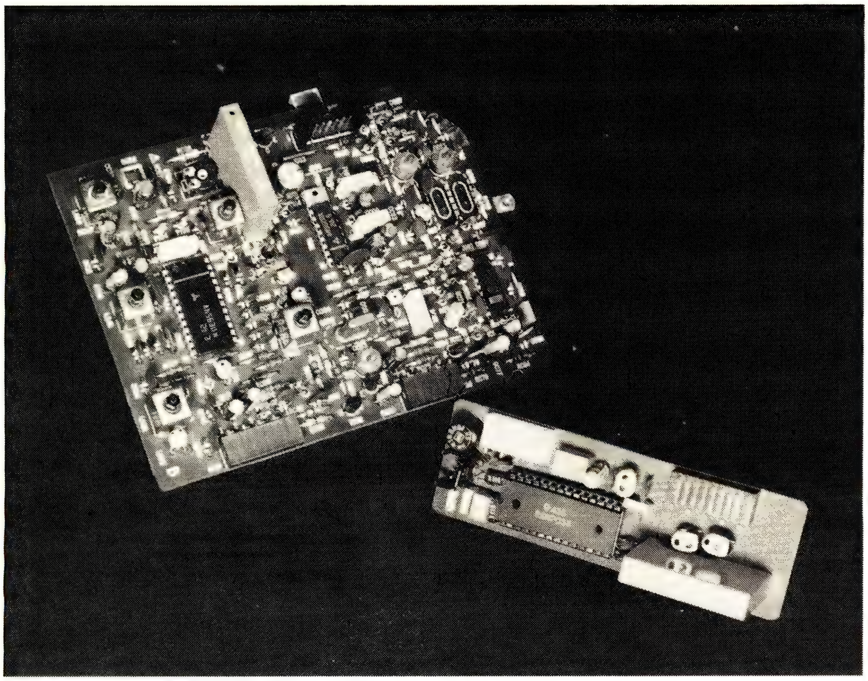
Filling the niche. Thomson plans to exploit that market opening with a set that revolves around two bipolar chips: one is a deflection processor for scanning control, and the other is a chroma controller that can decode all three world TV standards. Both are based on integrated-injection logic technology and are essentially digital—though they do contain some analog circuitry, particularly for phase control.

Thomson's chroma processor, which carries the development number ESM 7033, uses a proprietary system to automate the filter adjustments—particularly critical in Secam decoding—and phase and amplitude delay-line compensation. In addition, the chip uses a single external frequency reference from its related microprocessor, eliminating the need for a quartz oscillator.

The ESM 7033 has an on-board programmable logic array that generates precise reference frequencies for the three broadcast standards. This takes up a lot of real estate—about 22 mm^2, admits Bernard Potier, Thomson's marketing manager for consumer bipolar ICs. By 1986, however, the company expects to be producing the chip in a high-density process that will shrink it to no more than 15 mm^2 and trigger a corresponding decrease in price.

Thomson's TEA 2026 deflection processor uses a ceramic 500-kHz voltage-controlled oscillator and a chain of dividers and logic circuitry to accurately produce sampling pulses and timing signals—a technique that avoids the frequency adjustment usually required in standard systems using line and frame oscillators. The circuit is Thomson's contribution to its pact on second-source TV circuits with Telefunken Electronic GmbH [*ElectronicsWeek*, Oct. 8, 1984, p. 40].

Thomson will try to get a running start in marketing the deflection processor by offering it to two selected European customers, as well as to its own Consumer Products Division, so that they can begin designing the part into their TV sets. Already in volume production, the processor now comes in a set of four chips; a monolithic version should follow early next year. –**Robert T. Gallagher**



Digitally diminished. Conventional chroma function for a Secam color TV set populates a printed-circuit board measuring 110 by 110 mm. The same function based on a digital chip eliminates enough discrete components that it requires a board only 110 by 35 mm.

SOFTWARE

UNIX MAKERS HUNT MARKET

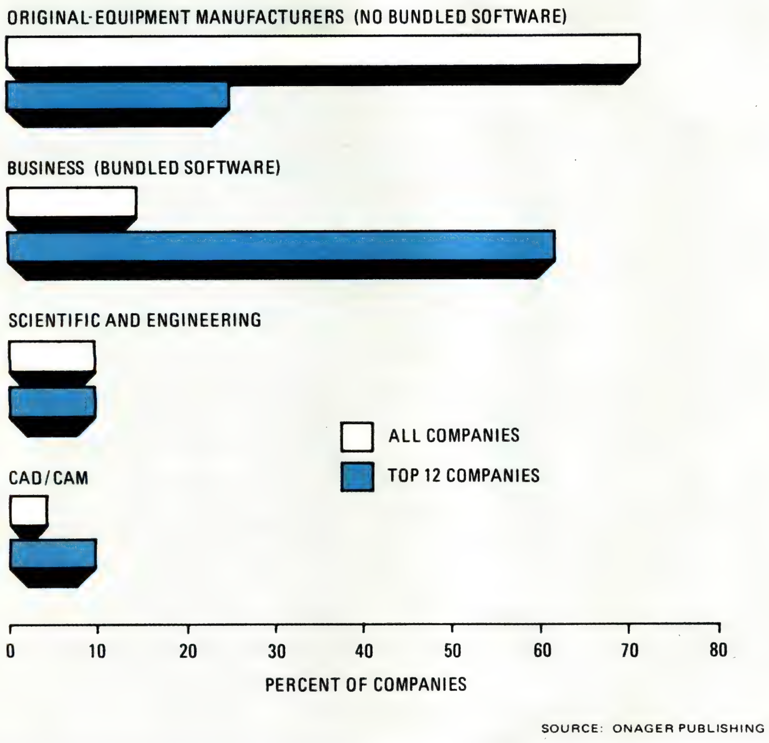
New York—There is very little doubt among industry watchers that the market for software products based on AT&T Co.'s Unix operating system is large and getting larger. At least 188 products based on the Bell Laboratories-developed Unix are being offered by 128 program-development firms. Nearly 60,000 units were shipped in 1983, according to Gnostic Concepts Inc., a San Mateo, Calif., market research firm. That total should double this year and exceed 200,000 units next year.

Nevertheless, there is some difference of opinion concerning the marketing roads that the Unix vendors are traveling. That difference was highlighted at a Unix conference and exposition held here in mid-October.

The market's top 12 companies, which accounted for 85% of all Unix units shipped last year, "look like lemmings heading for the cliff," asserts Ray A. Jones, president of Onager Publishing, in San Jose, Calif., which compiled the statistics for Gnostic. "The vast majority [of Unix-based software manufacturers] are going for the OEM market" rather than for sales to end users. "I don't think it's going to work."

Jones bases his conclusions on interviews with 85 of the 128 manufacturers that were asked to answer the question, "What market are you trying to penetrate?" Among all the companies interviewed, 73.6% said original-equipment manufacturers, as did 25% of the top 12 firms. In addition, 58% of the top 12 firms said their markets were business systems (see figure).

Small firms. Despite these results, Jones predicts that the emerging Unix market will be made up of smaller customer firms in the $5 million to $50 million sales range. But this market won't materialize until software vendors make improvements in their product lines, such as offering more products beyond readily available business applications



SOURCE: ONAGER PUBLISHING

Attractive. The majority of vendors who offer Unix-based software products are targeting original-equipment manufacturers as their major market, a strategy that could backfire.

packages, better distribution channels, and, most important, extended customer support. He estimates that business end users in the emerging market will require three times the support needed by OEM customers.

Visualizing the Unix marketplace as a pyramid with Fortune 500 companies at the peak and small companies with annual revenues up to $5 million as a base, Jones characterizes the market between $5 million and $50 million as ideally suited for smaller machines such as multiuser microcomputers.

No alternative. For this market, "There really is no viable alternative to Unix," notes Paul Miller, executive vice president of sales and marketing for Horizon Software Systems Inc., San Francisco, and a follower of the Unix market.

To get a clear picture of Unix market directions, "I think you have to look at what IBM, DEC, and AT&T are doing. There is definitely market share at any of these levels," he says, referring to Jones's market pyramid.

Jones predicts the Unix market will level off in the next three years as AT&T and IBM Corp. together grab 50% of the market. Mike DeFazio, manager of software marketing and development at AT&T's Software Systems Division, in Greensboro, N.C., says his firm will aim for all segments of the Unix marketplace from work stations to high-end systems. Predictably, DeFazio says, "We see the market opportunity being very large."

Industry standard. Another issue influencing the Unix marketplace is whether a version of Unix will become the industry's standard operating system. Jones says Bell Labs' current version, Unix System V, along with enhancements from the Berkeley Software Distribution developed by the University of California at Berkeley, may provide the most user-friendly standard. Says DeFazio: "System V is an evolutionary standard. We do see it evolving with the technology."

According to Jones, the number of hardware manufacturers using Unix-based operating systems has remained relatively stable for the last nine months, but he predicts 10% of them will be out of the Unix business next year. "Most of them are now surviving on venture capital."

And despite the fact that AT&T developed what may become the industry's standard operating system, Jones regards the telecommunications giant as only "a $40 billion start-up company in the computer marketplace." AT&T's DeFazio acknowledges his company may be considered relatively new in the computer market. Still, he points out, "We're not a start-up in terms of the technology." –**George Leopold**

DISK DRIVES

ZENITH BUYS WINCHESTERS

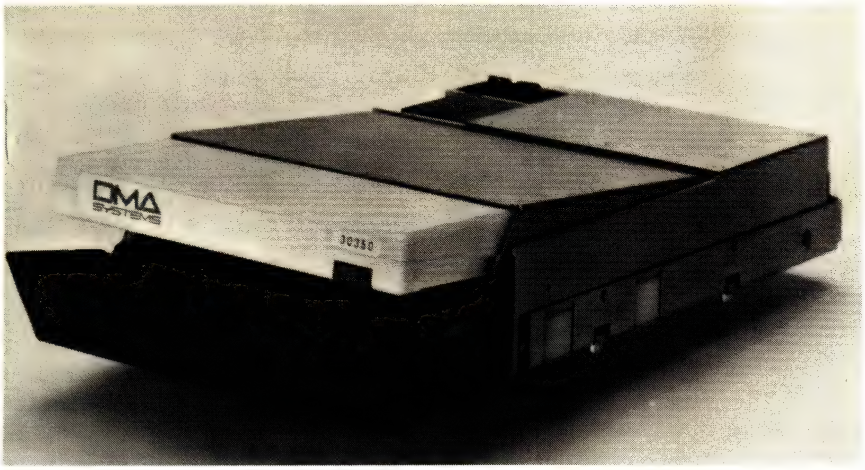
Goleta, Calif.—People who keep track of the industry agreed that it would probably take a heavyweight contract to establish the credibility of removable-cartridge Winchester disk

Spotlight shines on removable Winchesters

Award of the Zenith drive contract "should help spotlight the benefits of removable Winchesters," notes consultant James Porter, whose "Disk/Trend Report," published in Mountain View, Calif., closely follows this business. "Government customers are the surest bets, since they like to lock up their data at night."

According to Porter, DMA Systems has handled its resources well in balancing development of the product. It recently completed a fourth round of financing, for $7.1 million, making a total investment of more than $29 million.

Syquest Technology, too, has exploited another, less visible, market for removables in add-on subsystems for IBM PC owners who want a backup for their data bases. But because the IBM PC add-ons are sold through the retail outlets, says Porter, they pass unnoticed by the industrial equipment business. Syquest has installed more than 30,000 of them. –L.W.



Ins and outs. Security-conscious organizations can take the cartridge out of the DMA 360 half-height Winchester drive and lock it up for the night. A pull-out top drawer and a spring-loaded sleeve facilitate cartridge loading and positioning. Capacity of the disk is 10 megabytes and access time averages 97 ms, considerably slower than that of conventional drives.

drives. Such a contract emerged late last month, when DMA Systems Corp. here announced that it will sell a minimum of 6,300 10-megabyte half-height drives to Zenith Data Systems.

The removable-cartridge products have many things going for them—not the least of which is the advantage of protecting sensitive data. Still, the drives have been slow to take off since first making the scene in 1982. The biggest roadblock: building them in quantities large enough to snag volume customers.

But no one should look for the drives in the personal computers that the Glenview, Ill., consumer electronics firm sells to the public at large. Zenith has won a contract from the U.S. military to supply about 10,500 desktop Z150 computers for high-security work. That a user with classified material can take a disk out of the computer and lock it up clinched the deal for DMA, according to Zenith officials.

Landmark business. Proponents of removable drives are calling the contract a breakthrough. "It shows that a user has a choice about leaving data in his personal computer," says Raymond Gould, vice president of marketing at DMA. Even head-to-head competitor Syquest Technology, in Fremont, Calif.—which was frozen out of the Zenith award—finds a positive side.

"A significant contract," observes William Clanagan, regional sales executive for Syquest, "that should help with a lot of people who have never accepted the technology."

Although the award should help trigger more sales, manufacturers of the removable Winchesters must prove they have mastered certain technological hurdles. For one, keeping dust out of the enclosure is imperative. For another, space is so tight with the DMA 360 that the printed-circuit board must fold around the head-disk assembly—a tough task to accomplish in volume. Finally, since the head never rests on the recording surface, and loading takes place while the disk is spinning, a complex series of optical tests are necessary to ensure accuracy, positioning, and attitude.

Ramping up the line. DMA is not yet up to full production of the drive, which first began in August at a new facility in Santa Barbara, Calif., and can turn out only 75 per shift. The Zenith contract, however, could involve up to three times its stated minimum of 6,300 drives over a 5-year period. Depending on how Zenith's needs develop, some drives will be built-in; others will be external in either dual or single versions.

Syquest gives its own production figures at the 5,000-per-month level, with customers including original-equipment manufacturers, such as Convergent Technologies Inc., Santa Clara, Calif., whose Megaframe computer uses Syquest drives.

Dear and slow. Pricing is still steep. DMA will not give details of the Zenith contract, but the per-unit tab on 2,500 quantities is in the low $700 range. Evaluation units cost $1,295. Access times, too, are more than three times slower than conventional 5¼-in. Winchester drives; the Model 360 has an average speed of 97 ms. **–Larry Waller**

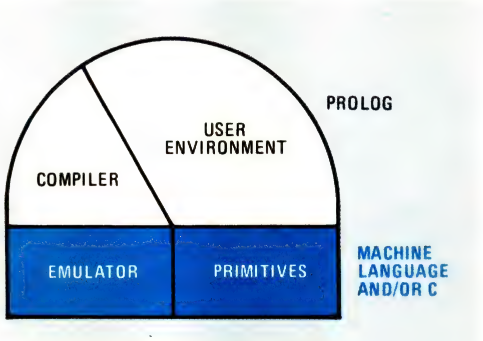
AI SOFTWARE

NEW DEVELOPMENT TOOLS BOOST PROLOG'S SPEED

Palo Alto—On the eve of Japan's November conference on fifth-generation-computer technology, a U.S. company has brought out the first development tools for Prolog, the principal language for the Japanese program. Quintus Computer Systems Inc., a start-up here, has implemented a fast and compact incremental compiler that will pave the way for new types of artificial intelligence applications.

Quintus was formed by some of the original developers of Prolog, including David H.D. Warren, who was instrumental in making Prolog available to Japan's Institute for New Generation Computing (ICOT). Warren is the principal author of the most widely used Prolog compiler, which was written for the 10/20 computer made by Digital Equipment Corp., Maynard, Mass. It was he who supplied ICOT with the tape containing code for this system.

Quintus has been marketing DEC 10/20 Prolog since last August. Its new software has been adapted to DEC's VAX and to the Sun 2 work station, made by Sun Microsystems Inc., Mountain View, Calif., both of which run the 4.2 BSD version of AT&T Bell Laboratories' Unix operating system. These machines are considerably less expensive than the DEC 10/20 but are in the same per-



Portable. The universality of the Quintus compiler and user environment interface means little change for the emulator and primitives for use on various machines.

formance ballpark. The company rates its VAX compiler at 23 klips—Prologese for 23,000 logical inferences per second, a measure of performance tied to the number of Prolog procedure calls. Each procedure accounts for one inference.

Cost-effective. The Sun software is rated at 20 klips, which Quintus says makes it the most cost-effective Prolog available; a Sun machine costs about $30,000, versus $250,000 for the VAX and up to $1 million for the older 10/20. Matsushita Electric Industrial Co., Kadoma City, Japan, is expected to unveil a developmental Prolog machine at the ICOT meeting next month, reportedly with performance equivalent to a DEC 10/20, or about 43 klips.

The Quintus software consists of the compiler, an editorial interface, a debugger, a style checker, and a compatibility checker for interfacing with other languages. Up to now, the lack of such tools has kept the number of Prolog applications low, according to Quintus marketing vice-president Carolyn J. Marshall.

Code for the Quintus software, plus a user work space, fits into a megabyte of main memory. In order to achieve high performance, the compiler was optimized to the Prolog instruction set, search algorithms were revised, and part of the code was written in machine language (the rest was written in Prolog and in C).

Although similar systems may be "in the closet somewhere," Marshall says, the Quintus tools are the first to hit the market. They are being beta-tested at four sites: a computer maker developing a "configurator" for its equipment; a military project to optimize plane loadings; a research lab developing natural-language software; and a semiconductor company developing a Prolog computer-aided design/computer-aided manufacturing system.

The UK, France, and Japan are still considered the largest markets for Prolog, Marshall notes, adding that the main U.S. thrusts in AI favor the Lisp language and Lisp machines. But she expects to see Prolog applications in natural language and data-base development once tools become available. **–Clifford Barney**

CONTROLLERS

VMEBUS HARD-DISK UNIT TAKES DATA OUT OF ORDER

Dallas—A new 32-bit VMEbus hard-disk controller jointly developed by Interphase Corp. and Mostek Corp. takes a rather unusual approach to quickening the access speed of high-performance storage module drives. Once the SMD heads are in the track that the host central processor is requesting, the intelligent controller immediately starts grabbing bits off the whirling disk without regard to the order of sectors in a track.

The out-of-order data from the disk is sorted, identified, and then directed to the proper location in main system memory by the controller's 16-bit 68000 microprocessor and multitasking firmware. The new SMD-compatible disk controller is believed to be the first peripheral board taking full advantage of the 32-bit data and addressing capabilities of the three-year-old VMEbus standard.

Initially targeted at emerging 32-bit engineering work stations and high-end industrial-automation markets, the V/SMD 3200 controller can also handle disk transfers of up to 24 Mb/s. That's nearly 10 Mb/s faster than most of the SMD disks now available.

Actions speak louder. This "act first, think second" accessing scheme is transparent to the system's host central processor and eliminates the rotational latency periods usually associated with turning the disks to the start of tracks. The 68000 handles the entire process, taking sectors out of sequence and relocating them into host-designated memory addresses. The zero-latency technique is also used to speed write cycles by eliminating the need to position disks at the tracks' starting sectors.

On the average, that means a saving of a half turn of the disk, or about 8 milliseconds, says Tom Thawley, vice president of engineering at Interphase, in Dallas. Under the joint development effort, Interphase worked on the new V/SMD 3200 controller's multitasking hardware and firmware. Mostek, in nearby Carrollton, is readying drivers for a variety of standard operating systems based on AT&T Bell Laboratories' Unix.

Both firms will manufacture the new disk controller, which is slated to be unveiled by Interphase Oct. 30 at Wescon/84 in Anaheim, Calif. Initial shipments of the VMEbus controller will begin in December, with volume deliveries scheduled to start a month later.

Besides the zero-rotational latency feature—first used on Interphase's recently introduced Storager board for Multibus disk and tape drives—the new VMEbus controller contains a forward-looking cache-memory algorithm that is tightly tied to the disk-accessing habits of Unix and RMX/86. Using the algorithm, the V/SMD 3200 anticipates the next likely disk access and places the data into high-speed static random-access memory on the controller board.

The caching scheme is an enhanced version of a technique used on Interphase's SMD 2190 Multibus controller [*Electronics,* Aug. 25, 1983, p. 52]. "At the end of each

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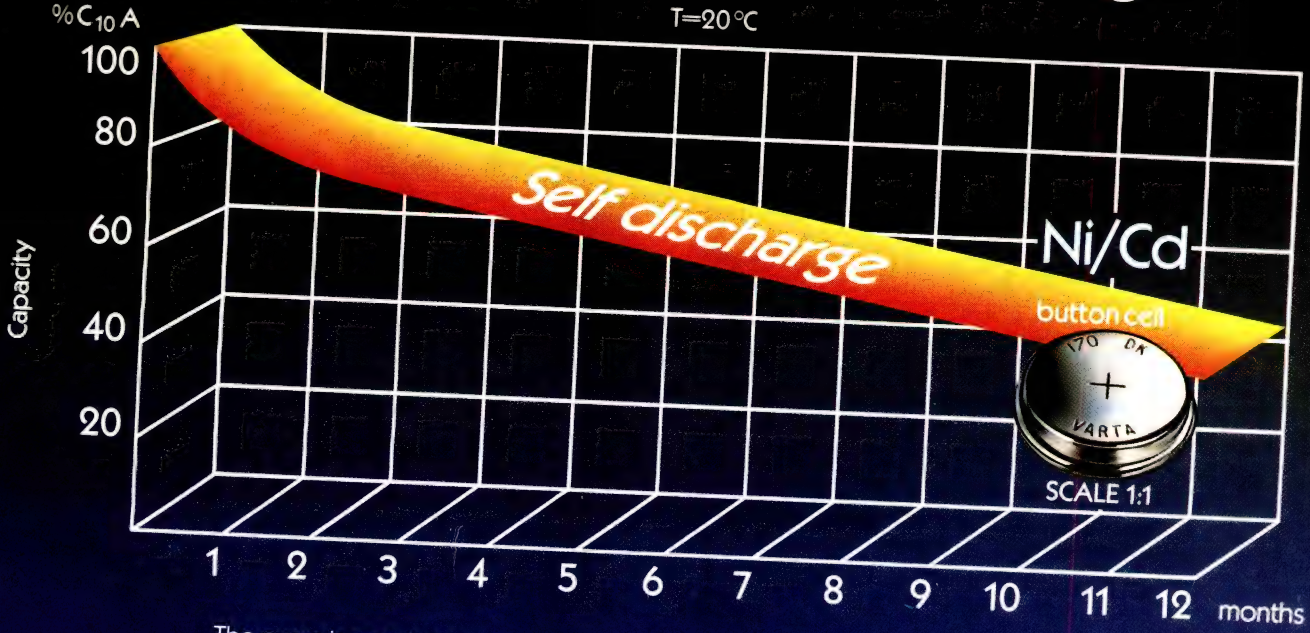

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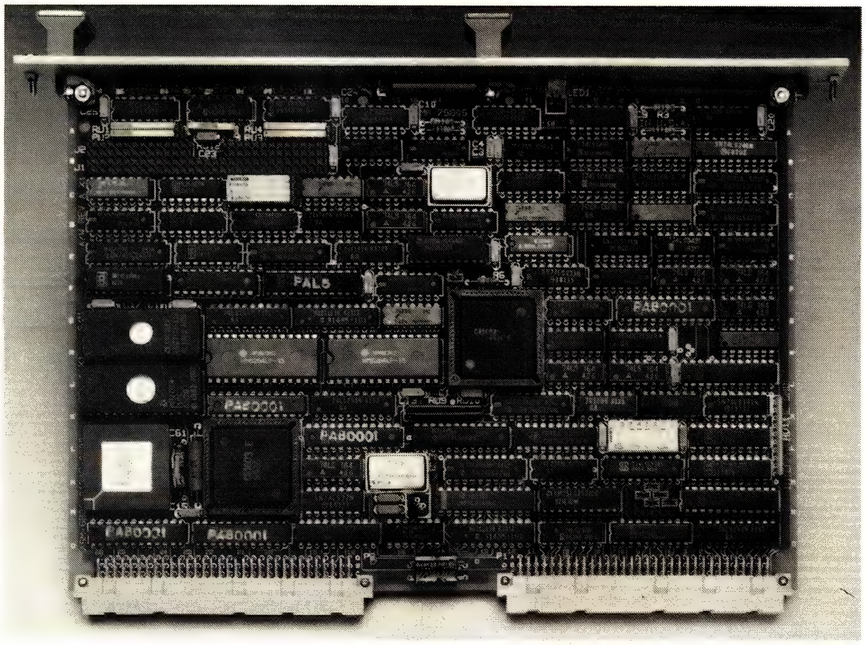

In control. Interphase Corp. reports that this SMD disk controller is first VMEbus product that supports 32-bit versions of the Motorola 68000 microprocessor.

transfer cycle, the cache ends up holding data that has been moved but not yet asked for," explains Thawley, adding that about 12-K bytes of the controller's SRAM is used to hold 24 sectors of data.

"Those 24 sectors represent our best guess at what the operating system will ask for in the subsequent operations," he continues. "In Unix, for example, there is a very high probability the next operation will involve one of the sectors already cached, and the system does not have to go to the disk again."

Compared with noncaching SMD controllers that interleave data 1:1 on the disk, the forward-looking algorithm results in a 40% speed improvement, says Ed Turner, marketing vice president at Interphase. The forward-looking cache is intended to speed up short accesses, while the zero-latency feature is aimed at saving time on long transfers.

Near perfect. Together, the controller's 68000-based multitasking architecture, 32-bit data and addressing bandwidth, software-programmable interrupt levels, the caching algorithm, and the zero-latency read-write features add up to what Interphase believes is a VMEbus controller that leaves almost no room for improvement in the future, according to Thawley. Under the control of a 10-MHz 68000, the intelligent controller packs as much computing power as many VMEbus central processing boards, yet it will hit the market with a price of $2,750 for a single unit.

In addition to the 16-bit 68000 engine, the controller contains two high-speed bipolar state machines based on 2,000-gate semicustom logic arrays. One state machine handles the front end of serializing and deserializing data to and from the SMD disks. It also performs bit transfers and error-correction functions. The second doubles as direct-access memory and multiport RAM controllers. Thawley says the trick was packing all the circuits for the multitasking controller architecture onto a standard 233-by-160-mm double-height VMEbus Eurocard.

The 68000 in the V/SMD 3200 is housed in a space-saving square pin-grid-array package. Much of the glue logic was placed in programmable-array-logic components. "We did nearly everything except for the use of surface-mounting technology," adds Thawley. **–J. Robert Lineback**

WESCON

ALL ROADS AT WESCON LEAD TO NETWORK TALKS

Anaheim, Calif.—As 85,000 or more engineers descend on the Anaheim Convention Center this week for Wescon/84, it will be difficult to plow a path through the crowds to the most interesting of the nearly 2,000 exhibits and the 40-plus professional sessions and panel discussions during the four-day event.

But among the roads well traveled will be those to the local-networking and data-communications panels, expected to be the big attention-grabbers of the show. For example, a discussion of networking solutions on silicon and two panels on a new proposal for a 100-Mb/s fiber-optic ring network will likely play to packed houses.

One reason is that ever since the successful demonstration of open systems standards at July's National Computer Conference in Las Vegas, manufacturers have eagerly sought a forum to convince their users they stand foursquare for the emerging networking standards. At Wescon, they expect to find a large and receptive audience.

In the spotlight. Integrated-circuit houses are center stage at one panel, "Local Area Network Solutions on Silicon," describing the challenges faced by design teams working to convert standards into economically viable products. The manufacturers are promising less expensive implementations and improvements in network efficiency. The reason is that once networking protocols are etched in silicon, it becomes easy and cost-effective to build both standard and nonstandard networks, says Vernon Coleman, department manager for local nets at Advanced Micro Devices, Sunnyvale, Calif.

Coleman maintains that AMD's three-chip set—transceiver, serial interface adapter, and Lance, or local-area controller for Ethernet—is a

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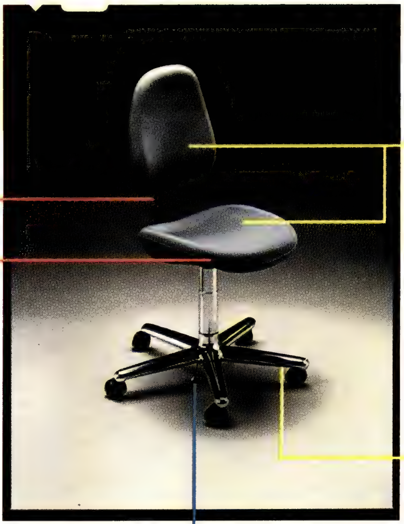

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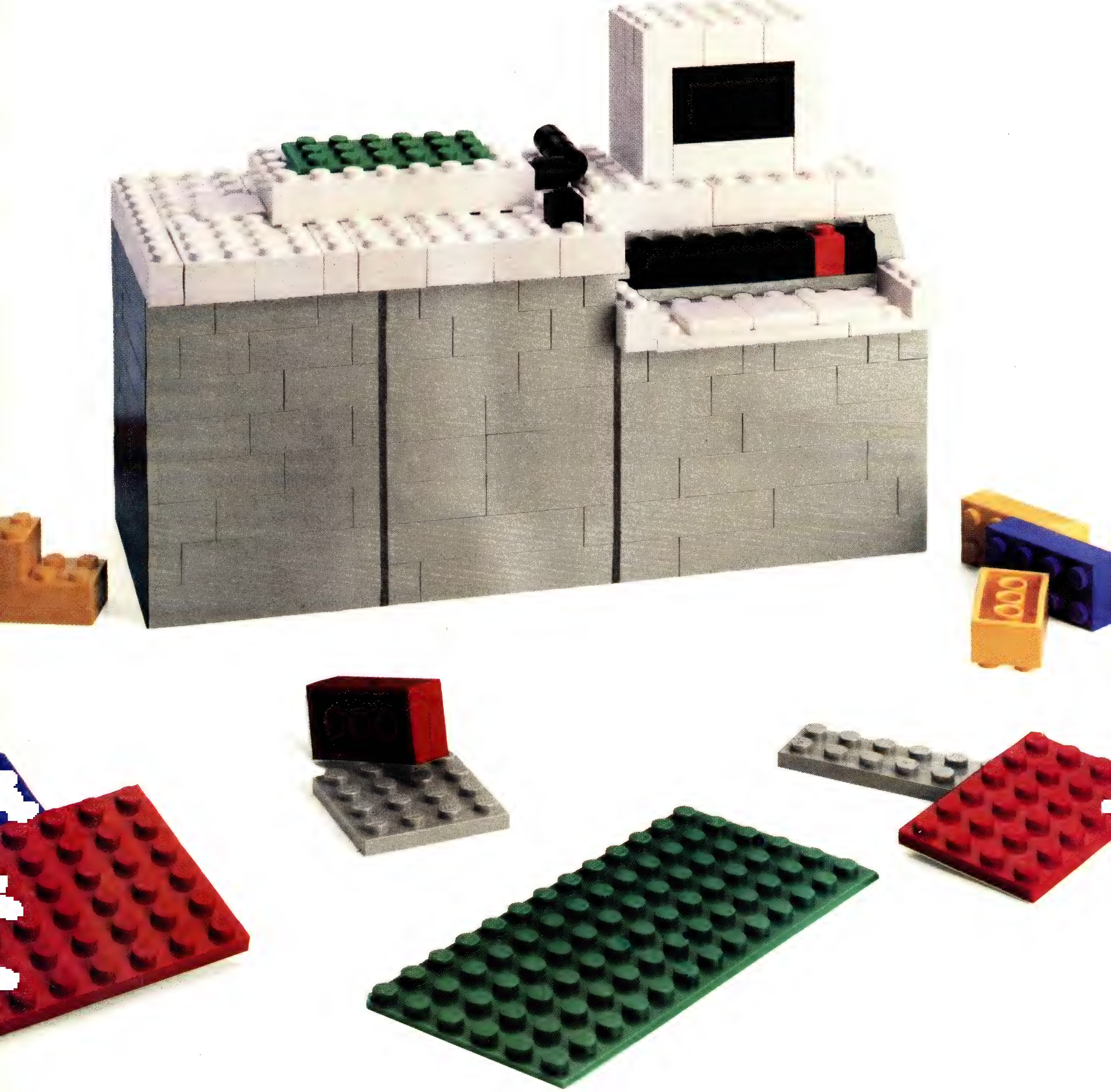

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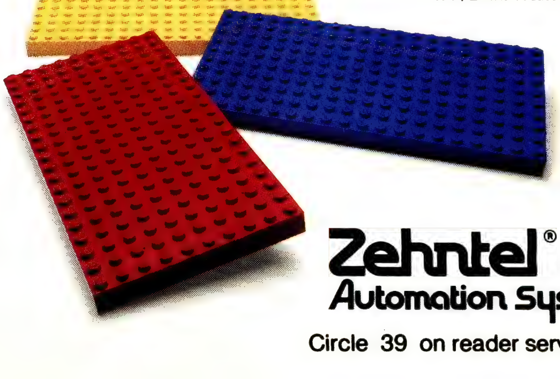

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cost-effective, very large-scale-integration solution for building an Ethernet or 802.3 network. Yet he also concedes that when "interconnectability and performance are not issues," a cost-effective nonstandard network can be built using other chips. If the cost per connection does not exceed 10% to 15% of the total node cost, and if cabling costs are not prohibitive, building a nonstandard network using VLSI may be the most advantageous route, he thinks.

Since the Ethernet chips have been around longer, the competition must be ready with a network architecture that can quickly gain user acceptance. To transform the token ring LAN architecture into "an information common carrier," hardware and software interfaces for attached products must be easy to implement, says fellow panelist John M. Hughes, manager of LAN programs for Texas Instruments Inc., in Houston.

TI, which is developing the five-chip token-ring set for the long-awaited network from IBM Corp., Armonk, N.Y. [*ElectronicsWeek*, Sept. 17, 1984, p. 17], is running its network adapter as a link list processor when devices are attached to the network. That means that just 10 high-level instructions are required for a device to get the full complement of network data and services.

Are there standards? Another panalist questions whether any true standards have been established. For Charles Yeager, an applications engineer in Santa Clara, Calif., for Intel Corp., a networking standard must have three components: an industry or standards-making group willing to write and back the proposal, acceptance by the user community, and "VLSI to make the proposal economically practical."

"The market just hasn't settled down yet," says Yeager. He notes that the Institute of Electrical and Electronics Engineers' 802.3 committee has before it two competing propsals for a version of a network using collision sense multiple access with collision detection that is less than 10 Mb/s. One is the 1-Mb/s baseband StarLan, pushed by AT&T Information Systems, Morristown, N.J., and the other is a 2-Mb/s broadband version proposed by IBM.

Another networking proposal already in silicon while still under consideration by the IEEE 802.3 committee, but one with plenty of backing, is the Cheapernet version of Ethernet. It is called Cheapernet because it runs at a full 10 Mb/s but uses less expensive RG58AU cable and BNC connectors. National Semiconductor Corp. is already producing a chip set, says R.V. Balakrishnan, a manager at the firm's Santa Clara, Calif., headquarters. National is betting that the low-cost cable-and-connection system embodied in the Cheapernet proposal will be part of the 802.3 standard.

Although complete agreement on the scope of local-net standardization is still in the future, networks are seeding other endeavors. On the theory that small is beautiful, Signetics Corp., the Sunnyvale, Calif., subsidiary of Philips, Eindhoven, the Netherlands, is taking the lessons learned from network designers and applying them to the problems of board-level communications.

When peripheral components requiring a parallel interface are placed on a printed-circuit board, they increase pin count just as quickly as they exhaust every available trace. Multiplexing the input/output lines means adding components. That increases costs, as does adding layers to the board for new traces. So Signetics developed an inter-IC bus consisting of just two bidirectional clock and data lines, making it possible to attach peripherals "without a significant increase in board real estate," says William Houghton, an applications engineer there.

Fiber in spotlight. But the talk at Wescon won't be all of LANs in silicon: fiber optics will share some of the spotlight. One topic of special interest is the fiber distributed-data interface, or FDDI, a proposal before the American National Standards Institute X3T9.5 committee for a 100-Mb/s fiber-optic token-ring LAN. Twelve speakers grouped into two panels—one focusing on systems issues, one on hardware-related topics—will discuss what observers say may become the standard for the backbone network of the future.

Floyd E. Ross, a professional consultant scientist and engineer at Sperry, in Blue Bell, Pa., says the FDDI was pushed along by two forces: manufacturers looking for a new high-speed standard interface that could work over great distances, and technological advances made in fiber-optic transmission technology.

An important goal of FDDI was to create interface symmetry—the alignment of interprocessor communications with I/O connections, so makers could eliminate the clumsy channel adapters and develop a leaner, more efficient generation of communications software.

Why choose a fiber-optic ring? High performance is only part of the reason, says Ross: efficiency is also important. The proposed standard stipulates that the ring, operating at 100 Mb/s, should run at well over 95% efficiency, even when it is loaded with 1,000 physical connections—a performance measurement calculated when the 500 nodes spread over 100 km were connected to two parallel rings, building a highly robust token ring. Another factor pushing the architecture was the recognition that bit-serial logic implemented in VLSI meant that good performance could be built into a relatively low-cost network.

–Robert Rosenberg

The biggest show marks IEEE's centennial

When Wescon pulls up stakes in Anaheim, Calif., on Nov. 2, it will have added to its luster as the largest electronics convention in the U.S. as well as helped celebrate the 100th anniversary of its sponsor, the Institute of Electrical and Electronics Engineers. The big show, which started life as the Western Electronics Show and Convention, in its latest four-day stand will have played to upwards of 85,000 spectators. The draw was a program that included 40-plus professional sessions and panels as well as more than 2,000 exhibits. Last year in San Francisco, its alternate-year site, Wescon drew 70,900.

A scheduled highlight was the commemoration of the IEEE's centennial at a dinner that had Ray Bradbury, the author, as featured speaker. Also marking the birthday was an historical exhibit displaying artifacts from electrical, radio, and electronics technologies dating back to 1922.

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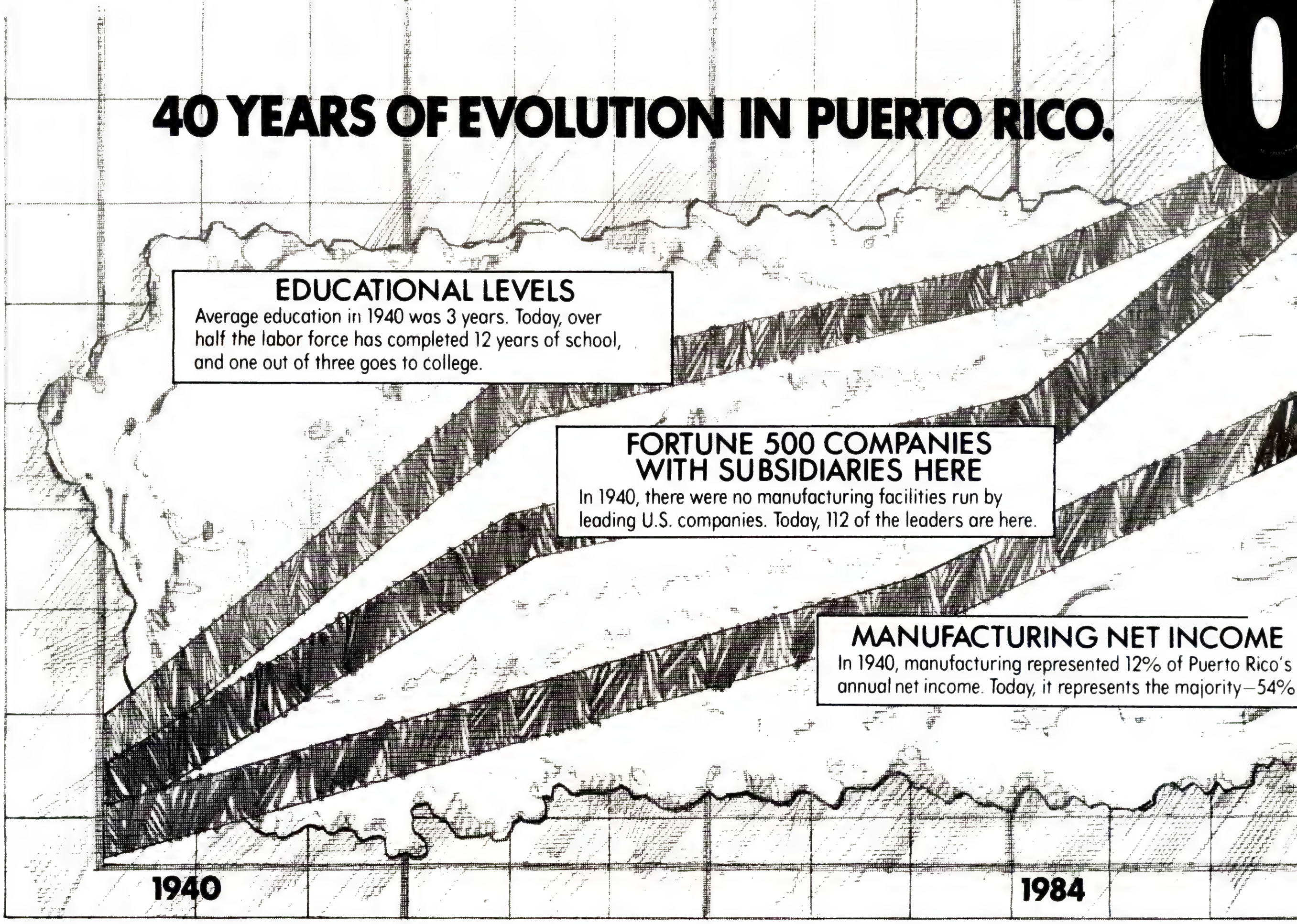

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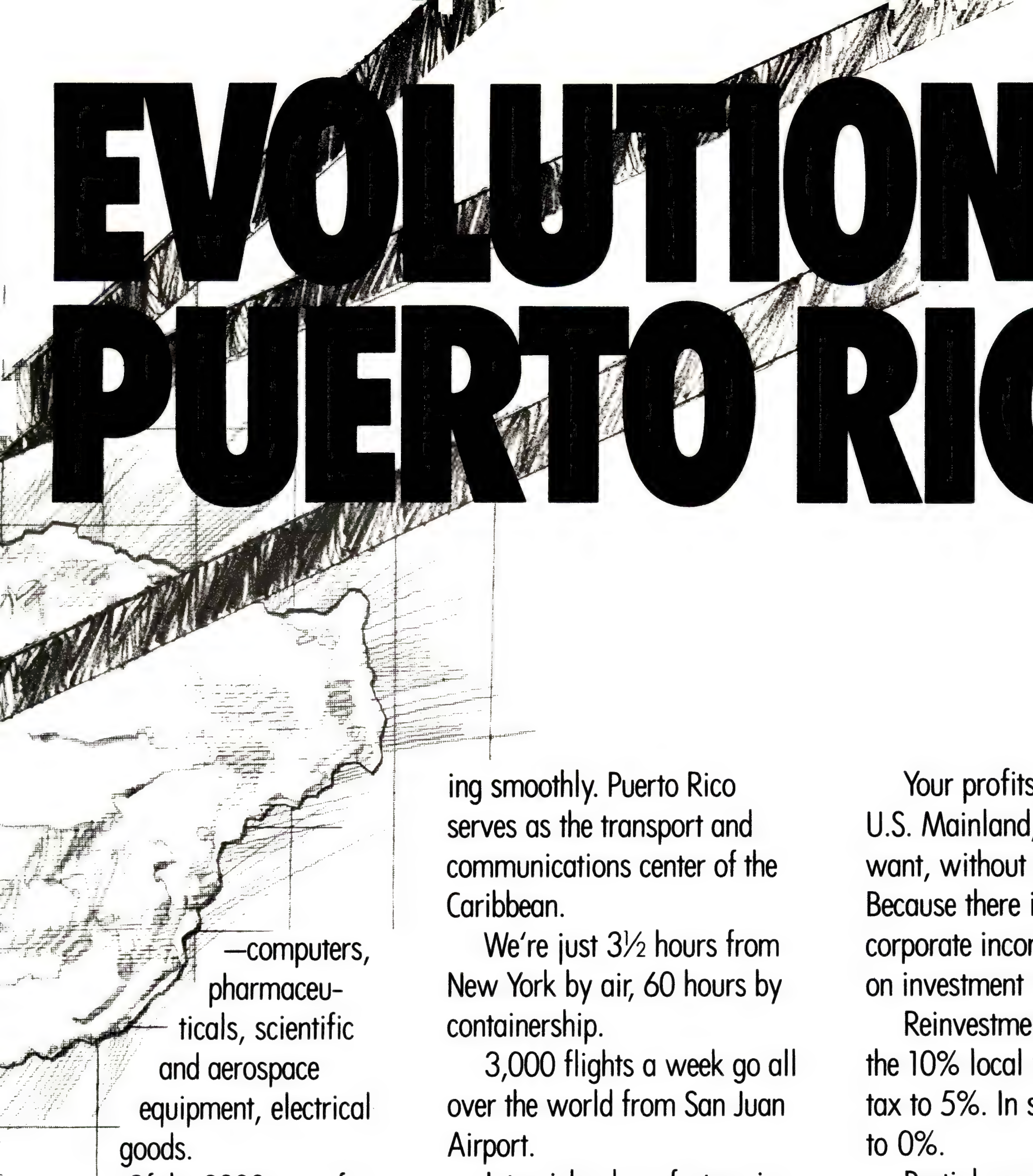

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There are reasons why people like Q.T. Wiles believe in Puerto Rico. Education, for instance. 150,000 attend colleges and universities; 60,000 attend technical/vocational schools. That means a skilled and available workforce. So far, over 68,000 workers are employed in high-tech industries.

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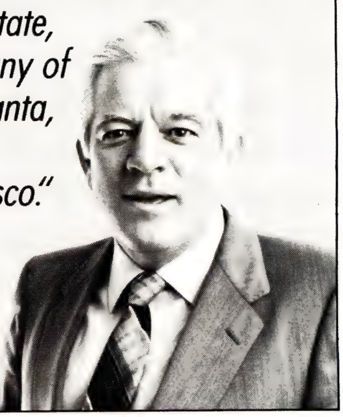

Carlos Romero Barcelo

Carlos Romero-Barcelo,
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*U.S. Internal Revenue Code Sections 936 and 243 (b) (1) (C). Section 936 companies are allowed to bring current profits home (as determined under TEFRA, 1982) without U.S. taxes. However, a Puerto Rico tollgate tax on distribution dividends of 10% or less, depending on the conditions under which funds are repatriated, will be levied. ©1984 Puerto Rico Economic Development Administration

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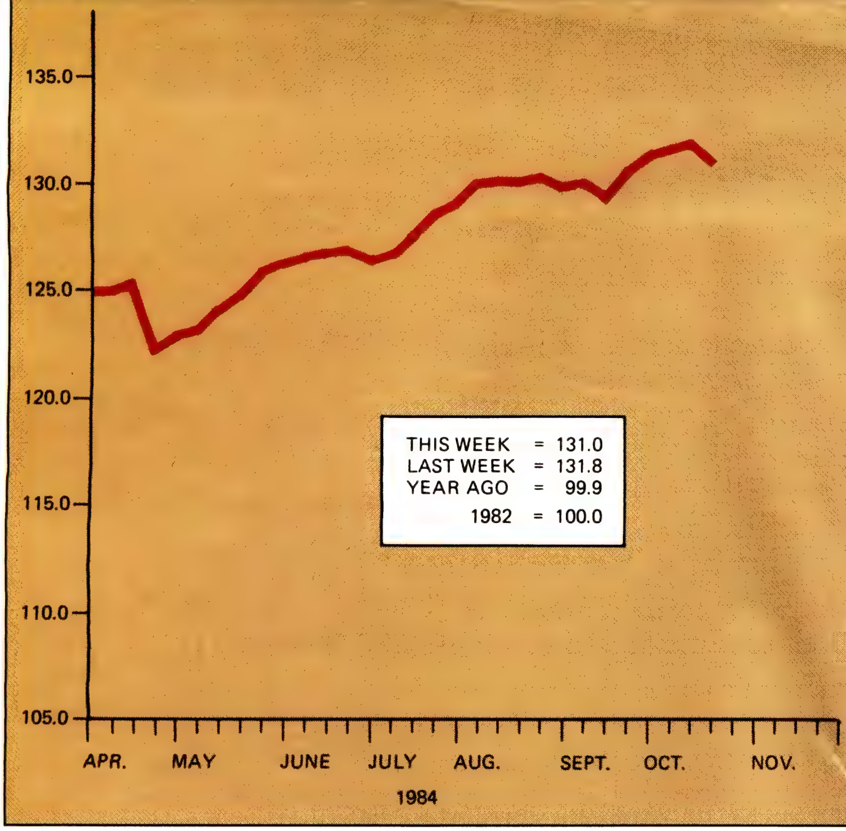
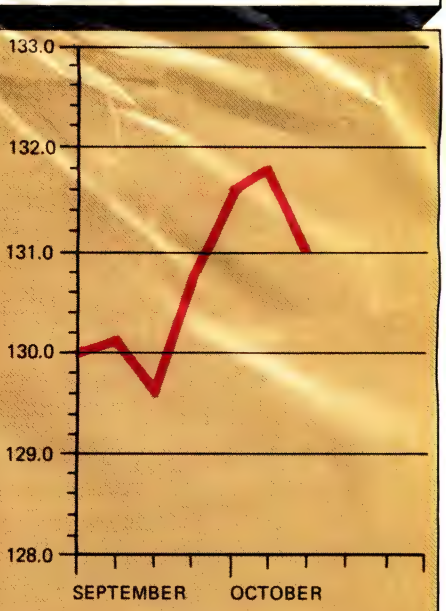
ElectronicsWeek Index



THIS WEEK = 131.0
LAST WEEK = 131.8
YEAR AGO = 99.9
1982 = 100.0



The *ElectronicsWeek* Index, a seasonally adjusted measure of the U.S. electronics industry's health, is a weighted average of various indicators. Different indicators will appear below from week to week.

U.S. ELECTRONICS IMPORTS AND EXPORTS (MILLIONS OF DOLLARS)

	IMPORTS			EXPORTS		
	August 1984	July 1984	August 1983	August 1984	July 1984	August 1983
Accounting, computing, and data-processing machines	282.497	375.109	195.194	537.912	589.682	438.028
Calculators	46.637	70.522	34.808	7.362	7.124	8.691
Parts for data-processing machines and office calculators	354.556	451.663	245.484	551.526	565.919	407.003
Telecommunications, sound-recording, and sound-reproducing equipment	1,470.886	1,696.795	945.404	285.474	373.902	296.384
Electronic or electric instruments	125.180	149.542	88.078	505.110	540.205	473.880
Printed-circuit boards	23.332	30.499	11.220	28.631	22.511	15.292
Integrated circuits, diodes and other semiconductors, tubes, piezoelectric crystals, parts	696.733	915.897	519.095	493.940	522.689	414.587
Fixed and variable resistors	26.020	38.100	20.573	16.276	15.316	14.534

Though the electronics industry's mountainous trade deficit improved somewhat after July's debacle, it pulled the *ElectronicsWeek* Index down almost six tenths of a percent in August. Exports fell 8% and imports fell almost twice as much, leaving the U.S. trade balance short $600 million.

With the industry used to a surplus, a trade deficit down one third from its July level is not much to celebrate. The U.S. dollar continues to batter major world currencies: after exchange rates surged by an average of 7.4% in July, however, August's 0.7% rise was slight. Now that interest rates appear to be heading down, exchange rates might also take a spill, bringing vigor in overseas markets.

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  COHERENT* – UNIX* V.7 compatible with C Compiler, Pascal and Fortran 77 in preparation.
- UNIX* – System V, Multi-User, Multi-Tasking.
- In development: memory boards with byte parity and 32 bit addressing; dedicated LAN-Controller; high performance communication I/O.

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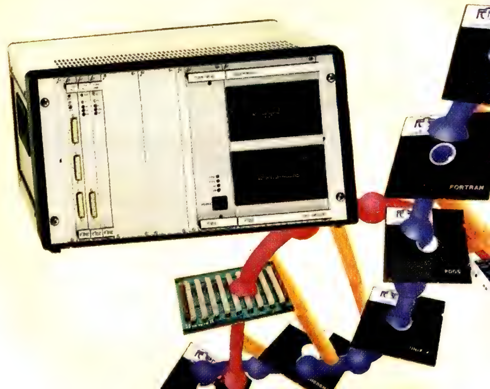

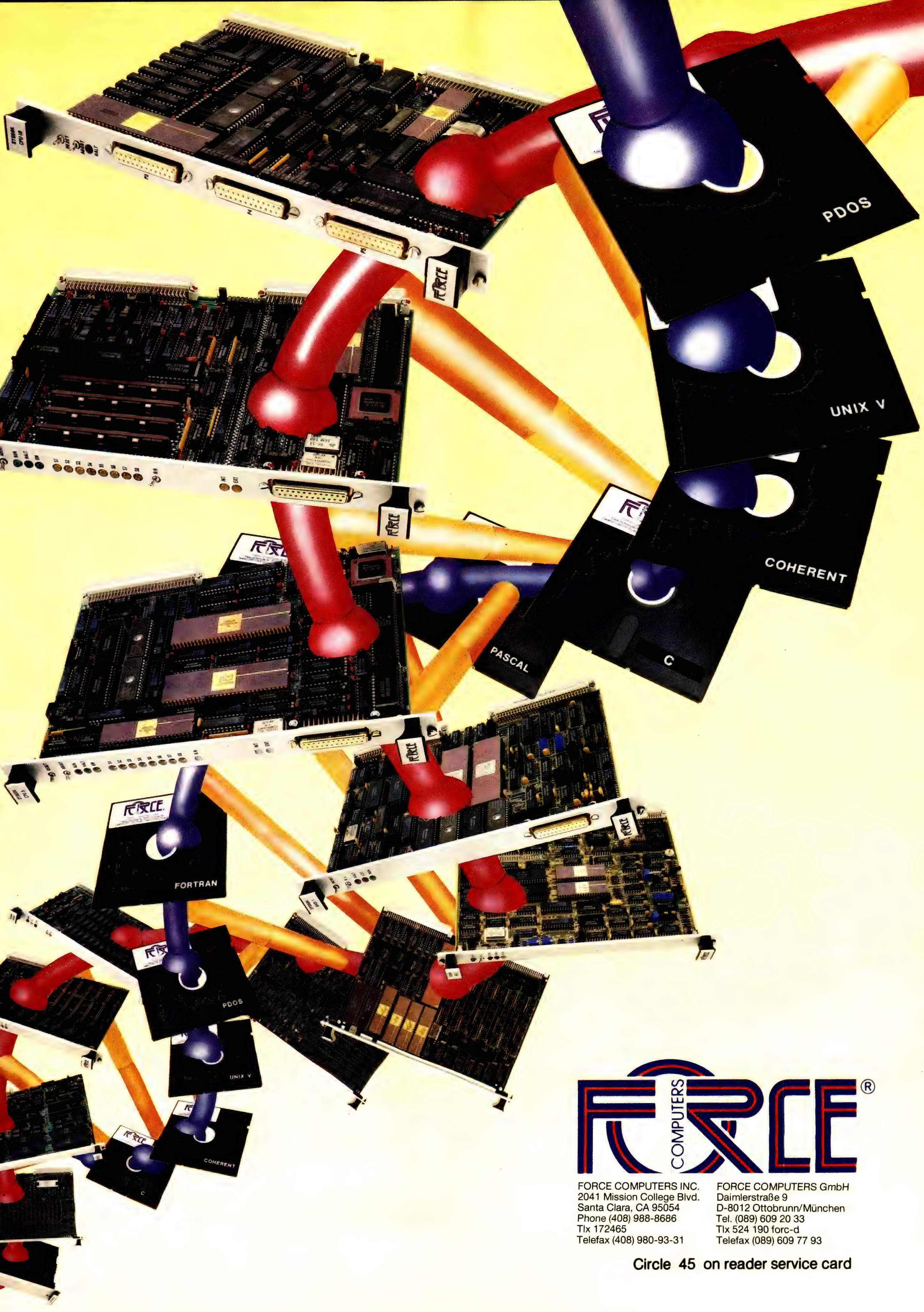

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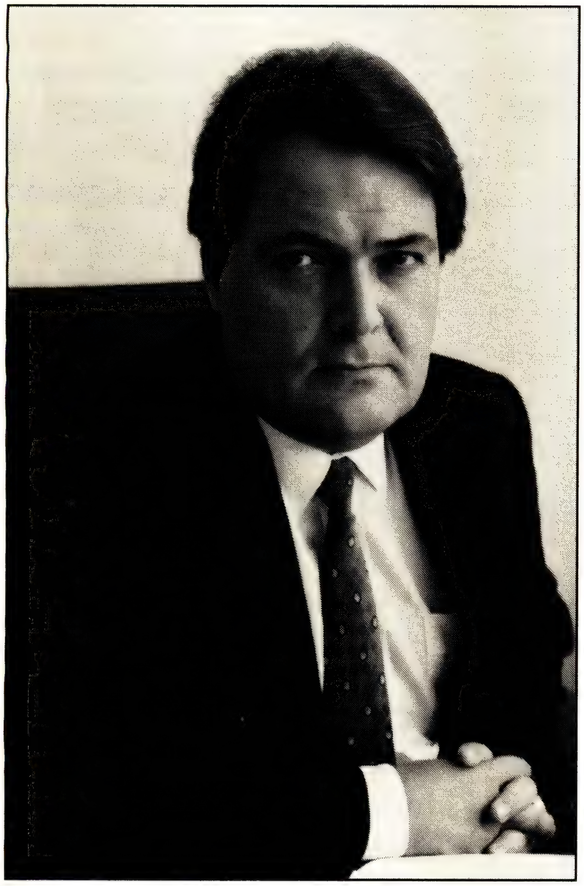
Circle 46 on reader service card

DUFAUX AIMS TO TRANSFORM FAIRCHILD INTO A PRIZEWINNER



Go for it. François Dufaux, newly appointed general manager, will probably get free rein in an attempt to make Fairchild's European operations into a company to be reckoned with.

Munich, West Germany

"To make our European activities profitable and grow faster than the market." That, in a nutshell, is the near-term task that François Dufaux, recently appointed general manager of Fairchild Semiconductor Inc.'s European operations, has set for himself. Such goals sound very much like those most semiconductor executives aim for—but for Dufaux, they pose a particular challenge.

So far, Fairchild Semiconductor—since 1979 a subsidiary of the New York oilfield services firm Schlumberger Ltd.—has not made much of a splash during its more than two decades in Europe. Preoccupied with activities and problems at home, company managers in Mountain View, Calif., had let Fairchild in Europe slip to the role of a mere distributor. As such, it has rarely, if ever, made a profit; at present, it doesn't even rank among the top 10 semiconductor suppliers this side of the Atlantic.

Dufaux's 20 years of experience in electronics, much of it in management positions, made him a good choice to turn things around. A graduate of the Lausanne Polytechnicum in Switzerland, with a master's degree in electrical engineering, he spent 14 years with Texas Instruments Inc., primarily in Europe.

In 1979, Dufaux joined Thomson-CSF as executive vice president and the head of the French company's Business Communications Group. He took on his present position last February, operating out of Fairchild's facility in Montrouge, a Paris suburb.

Dufaux is sure he will get enough rein to make necessary changes under a new Fairchild policy that gives its various operations more autonomy. "We want to play a major role," says the 45-year-old French executive. To be more precise, that means "turning a profit next year and being among the top six semiconductor houses in Europe by 1987." The vehicle for reaching these goals is a three-year, $170 million investment program for the European Fairchild operations.

Expanding facilities. The bulk of the investments—$140 million—has been earmarked for a new wafer-fabrication plant at Fairchild's facility in Wasserburg, West Germany, and for tripling the capacity of the test and assembly factory already there. The wafer-fab plant is slated to go on stream in 1986 for production of very large-scale FAST (Fairchild Advanced Schottky Technology) and CMOS chips.

Announcing the expansion program in Munich earlier this month, Dufaux pointed out that, beyond 1986, another wafer plant may be built in Wasserburg. Elsewhere in Europe, the Montrouge wafer-fab facility, for power devices, is currently being ramped up. As for linear integrated circuits, a new site in Europe will be picked next year.

Fairchild chose West Germany because of its stable society, concentration of electronics firms nearby, and the support given by the Bavarian government.

–John Gosch

Bell tries a new tack in distribution to keep up with industry change

Los Angeles

That major U.S. distributors—who are largely geared to selling electronic components—have been hard put to shift smoothly into hawking computers and peripherals is an open secret in this highly ingrown business. At fast-growing Kierulff Electronics Inc., for example, asking traditional sales people to go after an entirely new type of computer-using customer "honestly was beginning to give us a focus problem," even though they were successful, notes W. Donald Bell, president.

Bell and his firm's corporate parent, Ducommun Inc., have come up with an answer to this dilemma, which they believe breaks some new ground on how to organize a distributor to handle the mushrooming growth of systems equipment.

Different demands. "We recognize that different markets make different demands," which means staffing visible, separate organizations with specialists, says Bell. So the 47-year-old executive established the Ducommun Electronics Group, of which he is president. The company consists of four distribution units, each targeting a different set of customers.

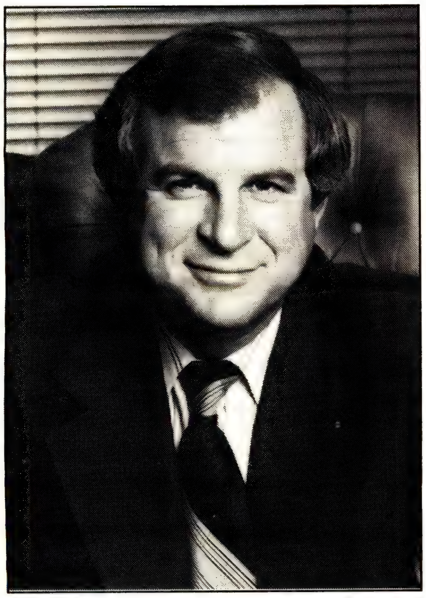
Of the group, least changed is Kierulff, which can go after traditional industrial customers for both computers and components "without distractions now that the diversions are removed," Bell observes.

That part of the new group that is attracting most attention is Ducommun Data Systems, newly formed to supply systems to value-added resellers. It already has made waves by sewing up initial rights to sell AT&T's 3B Series of minicomputers.

The remaining parts of the group are Metermaster, formerly a division and the second largest distributor of instrumentation and test equipment, and MTI Systems Corp., a recently acquired Port Washington, N.Y., firm that sells to commercial computer end-user customers.

Besides the advantages of a well-defined organization based on solid market niches, the new group setup offers something else. "It's a solid track for advancement for good people, and we have a lot of them," says Bell. Historically, upwardly mobile distribution executives often had to jump to competitors to improve themselves. With four units, there are more top posts, he points out, and many promotions already have occurred.

For Bell, who joined Kierulff in 1980 after a stint as top marketer at American Microsystems Inc., Santa Clara, Calif., the change frees him from day-to-day detail and lets him "look at the strategic questions, which I didn't have time for." He will not miss such duties as "figuring out who gets which office in our new building," a chore before the October move to new quarters in nearby Cypress, Calif. As Kierulff nears $400 million in sales, from $143 million in 1980, Bell has a dozen executives reporting to him. **–Larry Waller**



Quad-sell. To focus market, Donald Bell established a four-unit distribution company, each targeting a different set of customers.

Rezach's new software marketing firm seeks to bring users, packages together

Fairfield, N.J.

Brian D. Rezach says that during his two years with Sony Corp. of America, he heard a lot of griping from users unable to find the right software packages. Those complaints eventually became the seed of an idea that led him, at age 27, to form a software marketing firm earlier this year called Software Information Systems Inc.

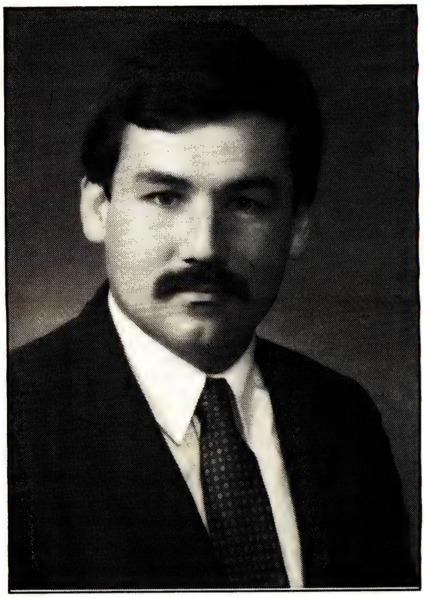
"It's always been an ambition of mine," he responds when asked why he formed a company and became its president so early in his career. "Two or three years ago, I would've said it would take longer."

Along with three recruits from Sony and the Sharp Electronics Corp.'s Audio Division in Paramus, N.J., Rezach is preparing a data base that would let software users know what's available and how one package compares with another. The system will use the microcomputer and modem hardware already installed in stores to access and try out the software products stored in the data base. It can also be used by outside salespeople with portable computers.

150-package inventory. "By using computer technology to sell computer systems, we believe we can bring the customer the ability to comparison shop," says Rezach. So far, the data base consists of 150 packages and carries with it a one-time $100 installation fee.

Rezach put in a two-year stint at Sony's Information Products Division, Park Ridge, N.J.—where, as an assistant national marketing manager, he also worked with local networks and communications software. Before that, he spent two years at Sharp as a national sales administrator. He has also worked for Control Data Corp.'s Service Bureau Co. in West Orange, N.J. A loyal New Jerseyite, he earned his bachelor's degree in marketing in 1979 from Seton Hall University, South Orange, and an MBA in 1983 from Fairleigh Dickenson University, Teaneck.

With the company's public relations firms lined up and new offices installed here, Rezach says market tests of the data base will begin around the middle of next month. It will be on line nationally beginning Jan. 1. Thus far, the firm has verbal commitments from three nationwide chains and about 200 other retailers, Rezach says. **–George Leopold**



Never too young. At age 27, Brian D. Rezach started his own company to provide users with a software-availability data base.

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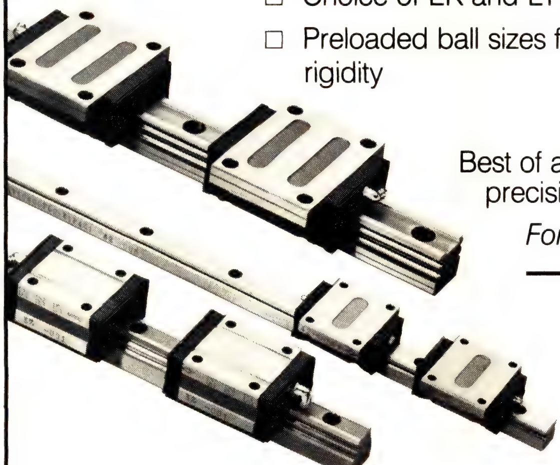

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REACHING NEW HEIGHTS IN MICROELECTRONICS

GERMANY

SPECIAL ADVERTISING SECTION

Germany's Electronics Industry Grows Stronger Day by Day

According to the doomsayers—specifically the English-language business newspapers and some native prophets—the German electronics industry will confront hard times. The German eagle appears to fly with drooping wings, these observers mock.

What's more, a few years ago, the Federal Republic of Germany complained its economic system would face an abyss because the citizens of Germany worked less than the Japanese, yet the Germans received higher wages. The doomsayers deplore what they see as a technological gap between Germany and the US and Japan.

A Bright Future

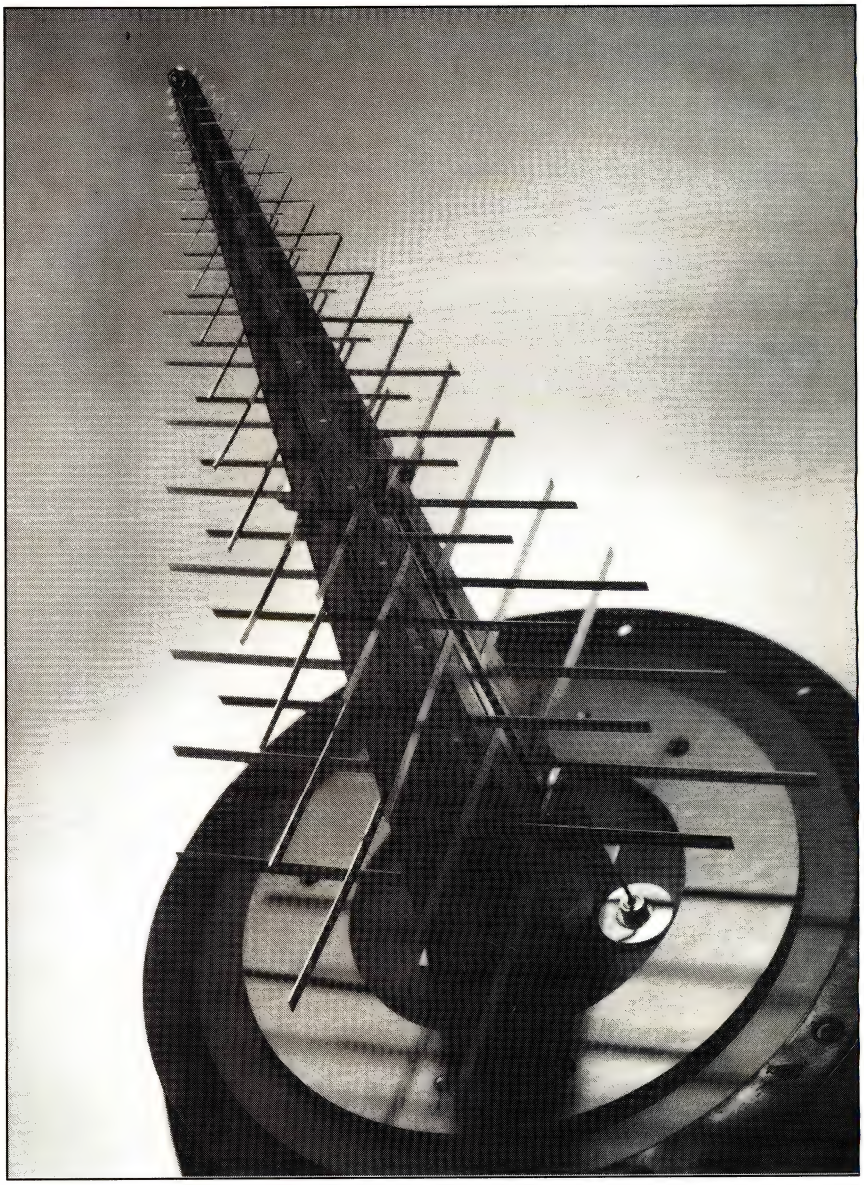
Yet a closer look shows that Germany is absolutely prepared for the electronic future. For sure, the total economic development has not been satisfactory in the past years: the gross national product has even been shrinking for some time. Imports have clearly outnumbered exports and the unemployment rate is at an unprecedented high.

But it would be capricious to think that Germany is no longer competitive. A competent analysis demonstrates that the German electronics industry—now as before—takes a top position in the world. The decline of German exports can be attributed to the enormous increase in the cost of materials and energy.

Also, currency fluctuations greatly influence the world market position of individual countries. If, for example, the exchange rate of the Deutsch Mark versus the dollar goes down, the monetary value of the German export goods drops precipitously. In volume, however, the number of exports may have increased.

A study of the European Communities commission in Brussels shows that in 1981 German exports nearly doubled imports, whereas the corresponding US export total was hardly higher than its imports. There can not be much to the slur "Germany was low on high tech."

The chancellor of the Federal



This crossed logarithmic periodic antenna from Rohde & Schwarz for 1-to-18 GHz is suitable for measurements and as an exciter for parabolic antennas.

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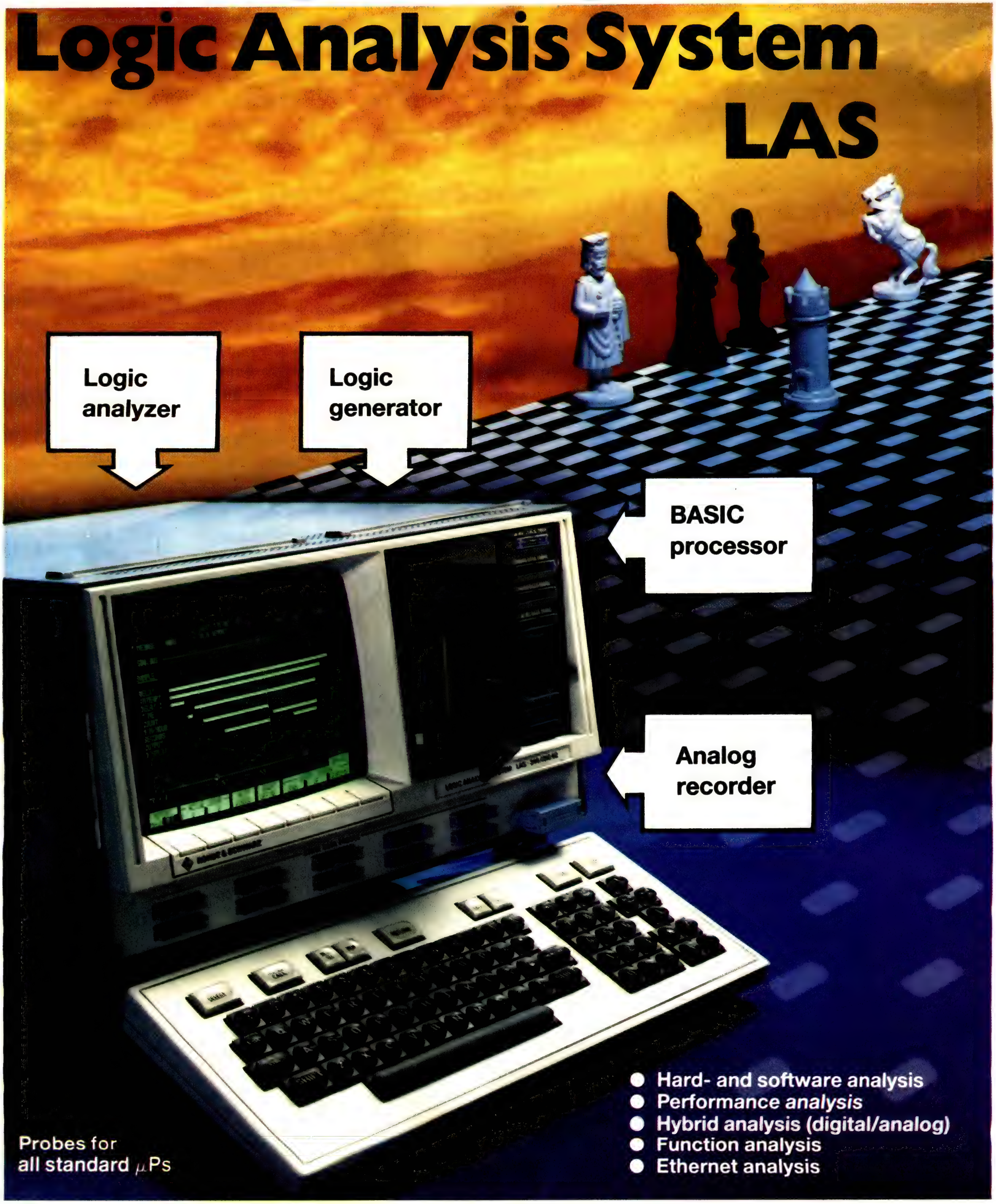

- Hard- and software analysis
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- Hybrid analysis (digital/analog)
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Republic, Helmut Kohl, though fears to preside over a nation of slowpokes. "We must get up earlier to be on top again," he implored the citizens of the second largest trading nation of the world. And a couple of his ministers too (see accompanying interview) leave no chance to view foreign activities as exemplary behavior for the people.

Optimism Abounds

Opinions may be divided, but the economic indicators signal optimism. For example, the central association of the German electrotechnical industry (ZVEI) proudly announced that for the first time in 1983 microelectronics production surpassed the 5-billion DM level. Moreover, the ZVEI released specific market figures: following internal counts, the total German components market reached 5.53 billion DM (+5% over the year before); for 1984, a 15% growth to above 9 billion DM is expected, according to the president of the components section, Friedrich Ruf. The strike in early summer only temporarily threw cold water on the upward tendency.

The recently appointed component president of Siemens, Dr. Herman R. Franz, points out that the development must be looked at differently, but optimistically: he sees the Germans as having strong positions in such electronic areas as telecommunications and in automotive and appliance applicaitons, whereas Japan excells in consumer goods like high-fidelity stereo equipment and video recorders.

A Word from Industry

Further, areas where Germany is weak include small computers and automation. And Fritz A. Lohmann, president of Valvo and board member of Philips as well as of the electronic components section of the ZVEI, calls microelectronics the driving motor of all development. Lohmann points at German microelectronic specialties in telecommunications, automotive, and entertainment.

Through the 1990s

Finally, Lohmann says, "If the German equipment industry continues to foster cooperation with semiconductor manufacturers, it will stay competitive on the world market."

Rolf Deubert, project manager at ITT/Intermetall in Freiburg, describes another example of successful home-grown development. "We at Intermetall have made real-time signal processing ready for application in consumer electronics."

A long-term prognosis—through 1990—from the ZVEI confirms the budding optimism: the German electronic market will grow at a 4% annual clip until 1990; at that time the

Electronica '84: Munich's proud component show

A biannual November event held in Munich, West Germany to hearld the world's latest components, the Electronica components show clearly ranks as one of the worlds' most important; for sure it is Europe's preeminent show. Components from around the world are given their debut here; products are carefully screened so that no non-component products water down the quality of the show.

Gerd vom Hoevel, managing director of this semiconductor event calls components "the soul" of all instruments and thereby the thermometer for their development. Western Europe only produces 8% of the semiconductors in the world, but consumes 20% (Germany alone consumes 6%) of the world production, he says, resulting in high dependence on imports in this field, a critical factor that may be one of the reasons for the present alarm in Germany. Still, the Electronica, with three new big halls, has a record of 2,183 exhibitors, when it opens next month. Vom Hoevel adds, "this proves that Germany remains an excellent marketplace for worldwide electronics.

This year's show, the eleventh since 1964, should attract in excess of 85,000 people. Electronica is a valued show because it points up trends in the components industry. Needless to say, strong emphasis will be on microprocessors and related devices as more industrial sectors pin their hopes on progress in microcomputer design.

SIEMENS

All components for electronics.

The important event for electronic specialists: »electronica '84« in Munich from November 13th to 17th.

Siemens, the largest German manufacturer of electronic components, will be demonstrating its know-how and capabilities. Components for surface mounting, and the latest innovations in our extensive product range: 256 K RAM and blue LEDs, telecom ICs and SIPMOS transistors with fast inverse diodes, argon lasers and surface-wave filters are just a few of the items that will be on display.

All components for electronics.
Visit the Siemens stand at the»electronica«.
Take the south entrance to the fairgrounds and come to the new hall 23.

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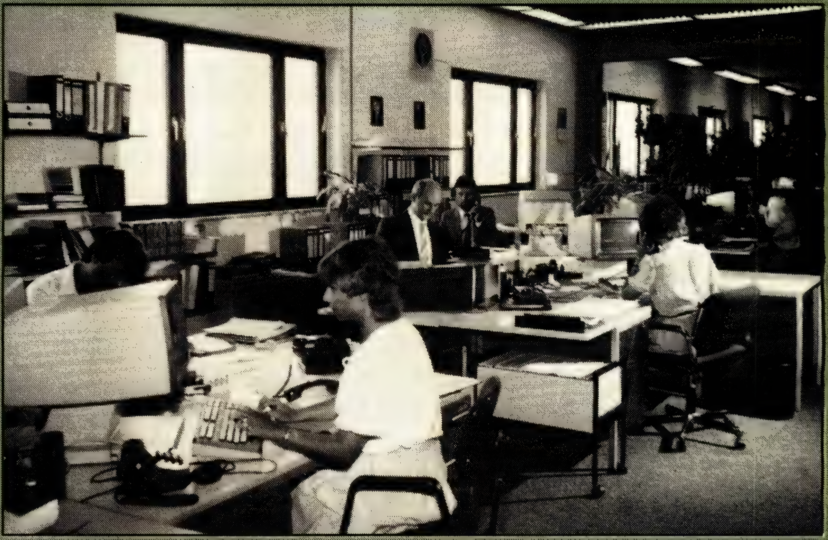
Corporate strategies: Jermyn GmbH component distributors

Today, Jermyn GmbH is one of the leading distributors in the UK as well as in Germany for semiconductors, passive and electromechanical components, microprocessors and development systems. The Jermyn GmbH in Bad Camberg currently has contracts for distributing products from such leading manufacturers as Intel, Motorola, National Semiconductor, Hewlett-Packard, Harris-MHS, and TRW LSI Products.

A 24-hour service and a diversified stock of semiconductors and systems worth 14 million DM are just one side of Jermyn, which also built up a powerful sales organization. Offices in Düsseldorf (since 1977), Baden-Wuerttemberg (since 1978), Munich (since 1981), and Norderstedt (started earlier this year) help to inform and advise the customer and foster a good working partnership.



Jermyn Gmbh has its roots in the UK, started in 1973 as a subsidiary of Jermyn UK. Founded in 1964 as a manufacturer of semiconductor accessories, the parent Jermyn UK then moved to distribution in 1968.

Since April 1983, Jermyn Holdings belongs to the Lex Service plc Group, London; in the same year, all shares of Prosystem was acquired as well as Sasco and Panel GmbH (the Lex Group furthermore owns Impulse and Hawke in the UK and Schweber in the US).

Moreover, Lex is a major shareholder of the David Jamison Carlyle Corp of the US. Worldwide, Lex Service plc works in electronics components and systems, vehicles, and freight service. The company's revenues in fiscal year 1983 were £900 million.

home market will have reached about 116 million DM. The study, undertaken exclusively for the ZVEI members, predicts a growth above average in data processing (+9.5%), components (+7%), and telecommunications (+5%). But the caveat to such development is the commitment of from 10% to 12% of sales for reasearch and development.

Nowadays, the president of the Munich-based Fraunhofer-Gesellschaft (FhG), Professor Dr., Max Syrbe, has uncovered a new technology spring. In his opinion, "the forces that have caused the technological gap have been significantly reduced." He supports his statements with figures: the German economy has spent 26.3 billion DM for research and development in 1983 alone, an increase of 6.2% over the year before. The government added 12.1 billion DM (+2.6%) and the various federal states an additional 7.7 billion DM (+10%).

The reason of the holtly discussed technology gap lies, according to Syrbe, in the combination of three factors: in the 1970s, application-oriented research was regarded as unrespectable; the industrialist avoided taking risks; and pretensiousness and grief comprised the entrepreneurial spirit.

Closing the Gap

The economic expansion that characterizes Germany today is having good results, exhibited by the fact that companies are participating in venture capital, in research support associations, and in research projects. "It is insufficient," says Siemens' research director Professor Dr. Karl Heinz Beckurts, "to buy state-of-the-art technologies. Key technologies must be under total control. The prime condition required to produce innovative products is the access to new technologies at any time."

To support this, German government has inititated vast measures in microelectronics, communicaitons, data processing, and automation. Data technology centers are being installed in the larger cities; but the project that evokes the most interest takes place in Berlin: German engineers try to reach a pole position in X-ray lithograpy, to lead in the race for still finer semiconductor structures.

They expect good chances in their submicron project because in this field, they think, all the world must start from scratch, giving them an equal opportunity when it comes to competition with the Americans and the Japanese.

The X-ray technology has been

Hartpapier **Papier bakélisé** **Laminated paper**	Bestell-Nr. No. de commande Part N°	Belastbarkeit Charge Power rating (Watt) lin (lg)	Grenzspannung Tension Limite Operating voltage (Volt)	Drehbereich Plage de rotation Range of Rotation Φ N	Anwend.-Klasse Classe d'application Application class	Maßstab 1:1 Echelle 1:1 Scale 1:1
Trimmwiderstand 8,6 "S", Kreuzschlitz, snap-in auf Anfrage **Potentiomètre ajustable 8,6 "S",** fente cruciforme, snap-in sur demande **Trimming potentiometer 8,6 "S",** cross recess, snap-in upon request	**60100-000***	0,05 (0,025)	100 (70)	270° ± 10°	HSF	
dito, *jedoch mit Innensechskant* **idem,** mais avec six pans creux **same as above,** but with hex actuator snap-in auf Anfrage snap-in sur demande snap-in upon request	**60100-001***					

Keramik **Céramique** **Ceramic**	Bestell-Nr. No. de commande Part N°	Belastbarkeit Charge Power rating (Watt) lin (lg)	Grenzspannung Tension Limite Operating voltage (Volt)	Drehbereich Plage de rotation Range of Rotation Φ N	Anwend.-Klasse Classe d'application Application class	Maßstab 1:1 Echelle 1:1 Scale 1:1
Trimmwiderstand 8,6 "S", Keramik-Cermet, Kreuzschlitz **Potentiomètre ajustable 8,6 "S",** céramique-cermet, fente cruciforme **Trimming potentiometer 8,6 "S",** Ceramic/Cermet, cross recess snap-in auf Anfrage snap-in sur demande snap-in upon request	**67360-000***	0,5 (0,25)	150 (100)	270° ± 10°	FKD	
dito, jedoch mit Innensechskant **idem,** mais avec six pans creux **same as above,** but with hex actuator snap-in auf Anfrage snap-in sur demande snap-in upon request	67360-001					

Trimmwiderstand 8,6

Für automatischen Abgleich und automatische Bestückung.

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Potentiomètre ajustable 8,6

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Snap-in sur demande.

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Comdex Oct. 29-Nov. 1, 1984
Electronica Nov. 13-Nov. 17, 1984
Hall 23, Stand B30.

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MITSUBISHI, an enterprise with a tradition that is long even by European standards, was founded in 1884 as a wharf by the Samurai Iwaski Family. The corporate symbol which is so well recognized today was borrowed from the coat of arms of the family: three diamonds in stellar arrangement. The origin for the company's name: "Mitsu" means three, "bishi" is the diamond.

The Mitsubishi Electric was founded in 1921. Today it is an enterprise with 23 production plants and 6 research laboratories, in which 50.000 employees achieve an annual turnover of more than 6 billion US-dollars.

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under examination in Germany since 1977, with members of the research group coming from FhG, Siemens, AEG-Telefunken, Valvo, and Eurosil; They are financially supported by the minister of research. Today, this group represents the largest research group in this field outside of Japan.

Action Proposals

It can easily be seen that Germany has structural disadvantages. And due to significantly higher wages, production is costly. But still more severe is the occasional helpless behavior that paralyzes the electronics industry. For example, no German company ever made a serious attempt to fight the heavyweights—Commodore, Apple, and Tandy—in personal computers. And the multibillion DM business for office automation equipment (including software) has for the most part been captured by the IBM Corp., Digital Equipment Corp., Wang, Hewlett-Packard, and Data General, foreign companies one and all.

Yet as mentioned above, the German electronics industry is not dead but seems to be just awakening from a long sleep. Hardly a year ago, 17 firms and associations of the information processing industry handed a memorandum to the Minister for Research and technology, Heinz Riesenhuber. Spokesman for the group, Klaus Luft (vice chairman of the board of Nixdorf Computer) interpreted the motives of the branch. If Germany does not want to lose touch with the world and wants to remain competitive, industry and government must immediately take suitable steps as outlined below:

- Reduce the cost of components, software, and subsystems.
- Initiate medium and long term research and development projects in conjuction with universities and research institutes.
- Take early initiatives and act jointly in international standardization bodies.

Actually, Nixdorf is an excellent example for the new trend *in the* German scene: Heinz Nixdorf's company takes in revenues of 2.7 billion DM annually and has 18,000 employees around the world. They understand their roles to be as problem solvers and service houses, as custom tailor with ready-made articles, concentrating on vertical markets like banking terminals.

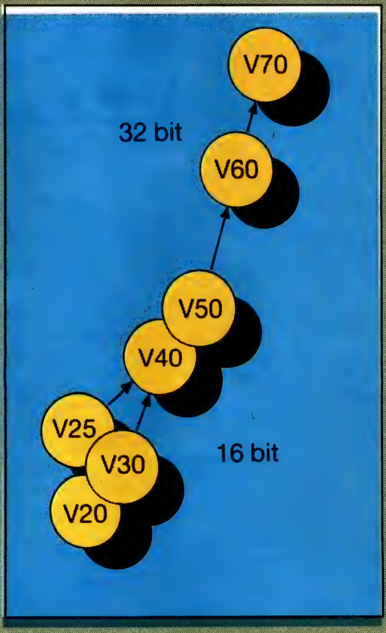
Altogether, there is hope for the German industry. In robotics Volkswagon and Audi are installing production plants equalling or even surpassing the Japanese standards. And recently Siemens laid the corner stone of its ambitious 1-megabit RAM fabrication facility.

The result of all that is that the German economy meets the challenge of the future. The wake-up calls of chancellor Kohl fortunately have given the German electronics industry the shot of adrenalin it needed. Germans have no reason to have inferiority complexes and hold their heads in shame. □

Corporate strategies: NEC Corp. CMOS component maker

Though it is active in all areas of electronics NEC Corp., when it exhibits as Electronica next month in Munich, wishes to emphasize its leading role as a supplier of advanced electronic components fabricated in CMOS. The center of NEC's presentation will be microprocessors, with samples of the new V series 16-bit and 32-bit systems. Also semicustom integrated circuits, such as gate arrays, will be exhibited by the Tokyo, Japan company.

The company will unveil its 16-bit V20 and V30 single chip microcomputers and its V40 and V50 32-bit parts, along with their peripheral chips. For gate arrays, NEC will exhibit the CMOS μPD65100 product line, including an array of 11,000 gates. For the industrial marketplace, NEC will present the μPD78312 8-bit CMOS microprocessor designed for real-time servo controls. Also the recently announced video random-access memory, the μPD41221C, with a capacity of 224-K will be shown in Munich.

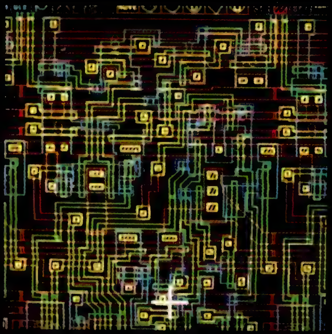


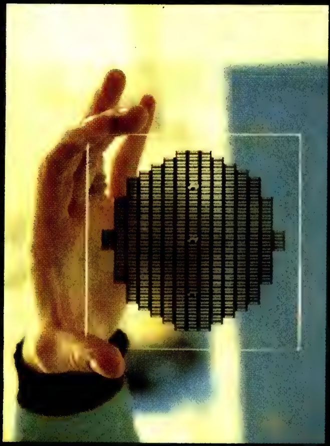
In the area of complex perihperals, NEC will be offering another new circuit, an image pipeline processor, the μPD7281. With a large number of dynamic, pseudo-static, and static RAMs, NEC clearly is a leader in memory technolgy. Another of the company's focuses is on erasable programmable read-only memory products, also constructed in CMOS.

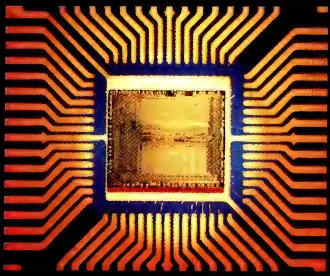
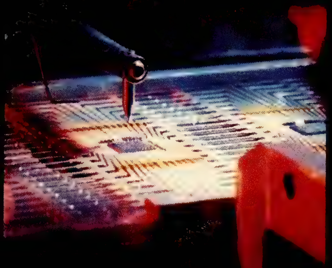
Furthermore, extended versions of complex peripherals like graphics, speech, and signal processing chips will be exhibited. Fiber optics and optoelectronic components will complete the firm's exhibit.

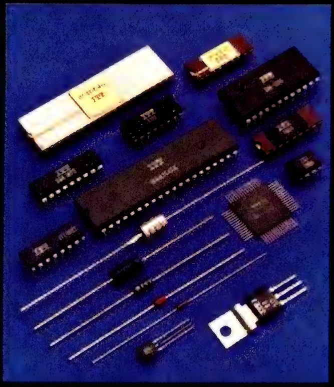
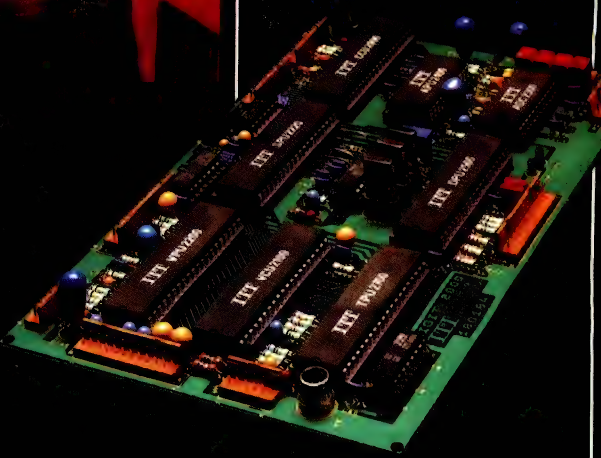
With the selective presentation of new and enhanced components from the most vital areas of micro- and optoelectronics, NEC illustrates its innovative power and proves its strong technological position.

Semiconductors made in Germany for the markets of the world





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German Minister Encourages Research and Innovation in Product Development

An interview with Dr. Heinz Riesenhuber, Minister for Research and Technology of the Federal Republic of Germany

Dr. Riesenhuber, where does German research and technology stand, particularly in electronics, in relation to activities elsewhere?

Those who argue that the Germans and Europeans are lagging, like to cite examples in microelectronics. For instance, they compare the US and Japan on the one hand with Europe on the other with regard to component production and per-capita consumption as well as expenditures for research and development. I don't want to make such comparisons. The recently endorsed Government Report on Information Technology states the goal of our policy in technology: we must ensure that the design and production methods that are domestically at hand for state-fo-the-art integrated circuits are broadly applied. We must direct our resources towards overcoming the essential bottlenecks that exist.

What is being done to improve the situation?

By a framework of incentives that encourage research and innovation we must ensure that new microelectronics-based product ideas are technically realized and implemented. The development of custom-tailored integrated circuits does not provide

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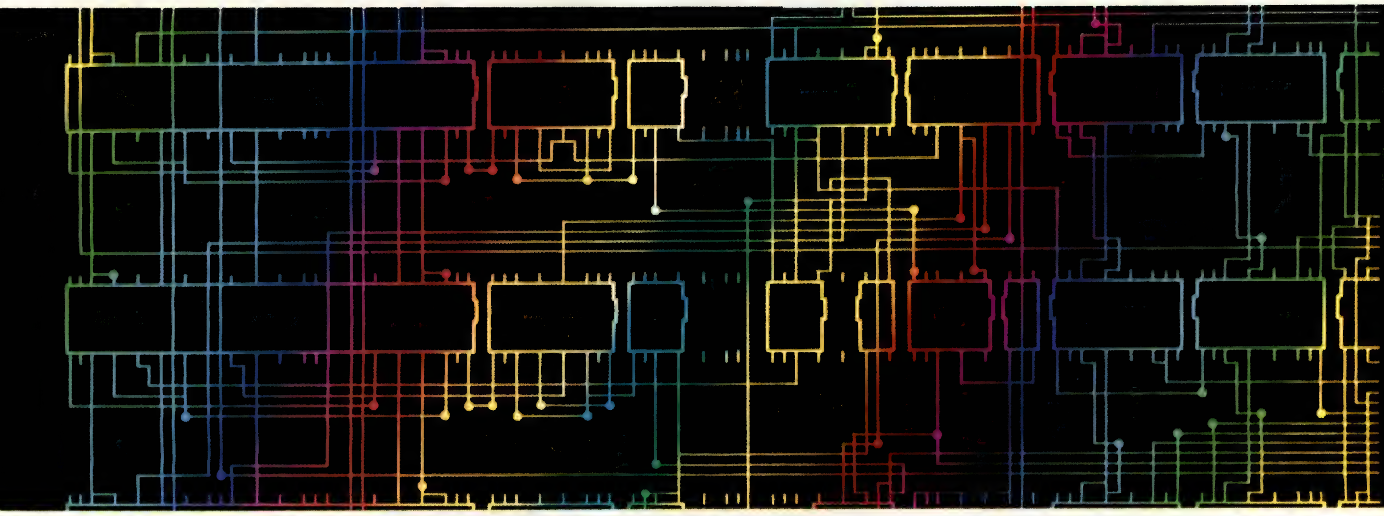
Dr. Heinz Riesenhuber, Minister for Research and Technology of the Federal Republic of Germany

NEC

Children by desire – in CMOS.



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7th International Congress and International Trade Fair
1 - 5 July 1985

SYSTEMS 85
Computer and Communication
9th International Trade Fair and International User Congress
28 October - 1 November

PRODUCTRONICA 85
6th International Trade Fair for Electronics Production
12 - 16 November

ELECTRONICA 86
12th International Trade Fair for Components and Assemblies in Electronics
11 - 15 November

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satisfactory solutions. Rather, the aim of our technology promotion is to support the further development of circuit concepts and fabrication techniques available in this country and to induce the industry to get itself more and more involved in microelectronics and its technologies.

Are the on-going worldwide comparisons that focus on relatively narrow sectors—in this case semiconductor tehcnology—a meaningful measure of a country's position?

The fact that the amount of economic activity that is driven by microelectronics has become an important factor in a country's overall economic performance has led to massive development efforts throughout the world. These efforts will accelerate into the 1990s. Against this background, it is meaningless to make year-to-year comparisons between one's own position and that of other countries.

What measures is the Ministry for Research and Technology taking?

Intensive discussions and planning have led to an aid-and-support concept with goals for the long term. But it does not lose sight of achievements necessary for the mid-term. The concept builds on three pillars: basic research, fabrication technology, and design techniques. It is to be implemented by German integrated circuit makers and the Fraunhofer Society. In this concept, basic research and fabrication technology, whose support was announced in the Government Report on Information Technology under the heading "Submicron Project," will have a prominent place.

Can you give a practical example?

Without basic research done outside the industry no modern technology can produce concrete results in the long term. The demands imposed by microelectronic design and fabrication

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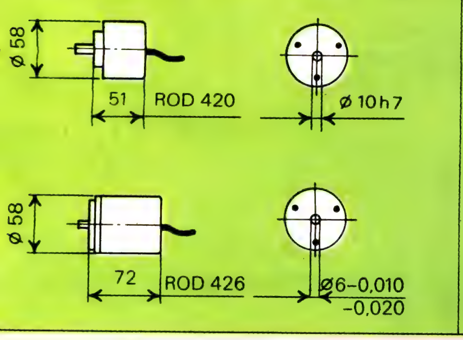

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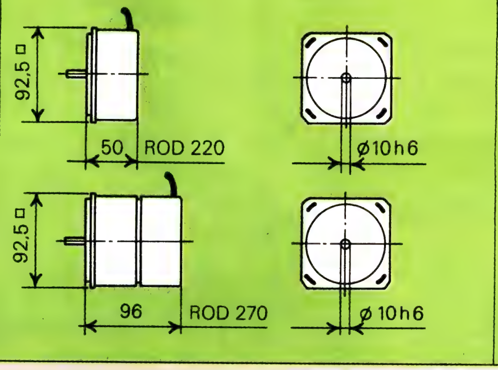

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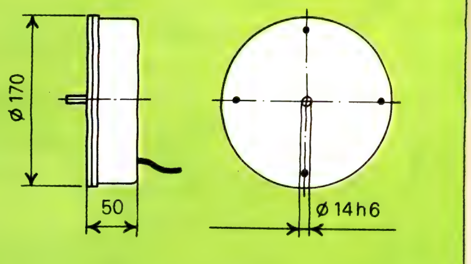

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technology on the equipment that is needed, on management organizations, and on logistics and materials supply, surpass the means of universities. This state of affairs is being overcome by the Fraunhofer Society, which is estabilishing a Department for Microstructure Technology in Berlin. That department is being fitted with the latest equipment for designing and fabricating integrated circuits and will become the hub of the "Multiorganization Submicron Project." Its goal is to explore the possibilities of producing structures down to about 0.1 micrometers by 1988. The first pilot line, to become operational in 1986, will employ X-ray lithography instead of today's optical techniques to produce these structures. Using the knowhow gained from operating the Berlin pilot line, semiconductor producers will be able to set up their own process lines starting in 1989. Subsequent developments should then, during the nineties, lead to the broad use of X-ray lithography in industrial production and to the replacement of conventional optical methods.

What do you think of this initiative? And will it bring the hoped-for results?

An ambitious proposal has been made to develop submicron memory devices as future lead components using advanced fabrication technologies. This proposal combines a determined effort to expand development capacity with bold investments and evisions the highest possible level of cooperatoin in establishing a technological base. I much welcome this initiative by the industry and I regard it as an important milestone on the road towards the Federal Republic of Germany attaining a top position in microelectronics internationally and its becoming a major supplier and user of microelectronic components in Europe.

How do you see the future of electronics and related industrial sectors?

The effects coming from the mobilization of the Multiorganization Submicron Project and the Submicron Memory Project will trigger new activities in fields like production equipment for microelectronic devices as well as assembly and packaging techniques for such devices. A sound technological base in optics and mechanical engineering gives Germany favorable starting conditions. I expect additional incentives to come from the Esprit program. I am confident that we will reach our goals. ☐

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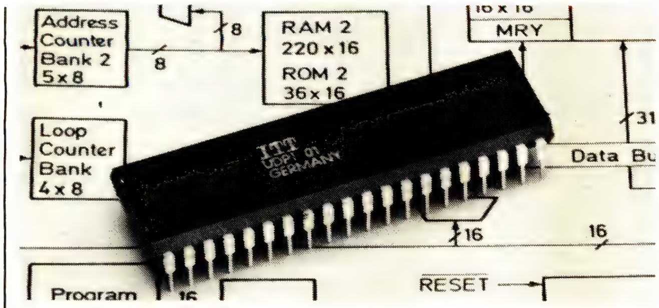
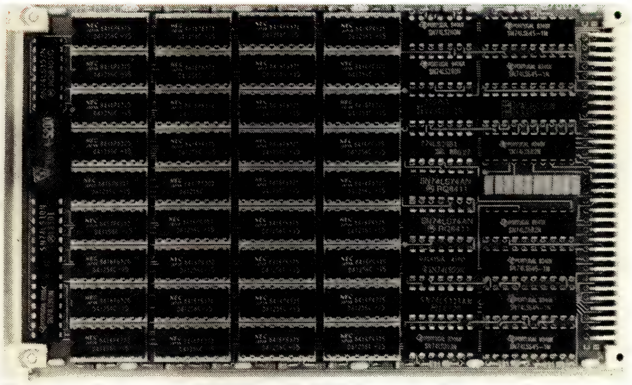


ITT/Intermetall is unveiling its UDPI 01, a real-time digital-signal-processing chip. Housed in a 40-pin plastic dual in-line package, the CMOS chip uses pipelined program execution and fits nicely in Multibus based systems. The basic arithmetic instruction is multiply-and-add, which is carried out in two cycles, each taking just 100 ns. The results have a 31-bit resolution, using 2's complement logic. The chip will be start rolling off the production lines in mid 1985.

[Circle reader service number 450]



PEP Elecktronik Systeme GmbH has packed the 100-by-160-mm VMEbus board with one megabyte of random-access memory. The board is packed so densely because 16-pin memory modules containing 256-K-by-1-bit dynamic RAM chips are used.

[Circle reader service number 451]

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Circle 131 on reader service card

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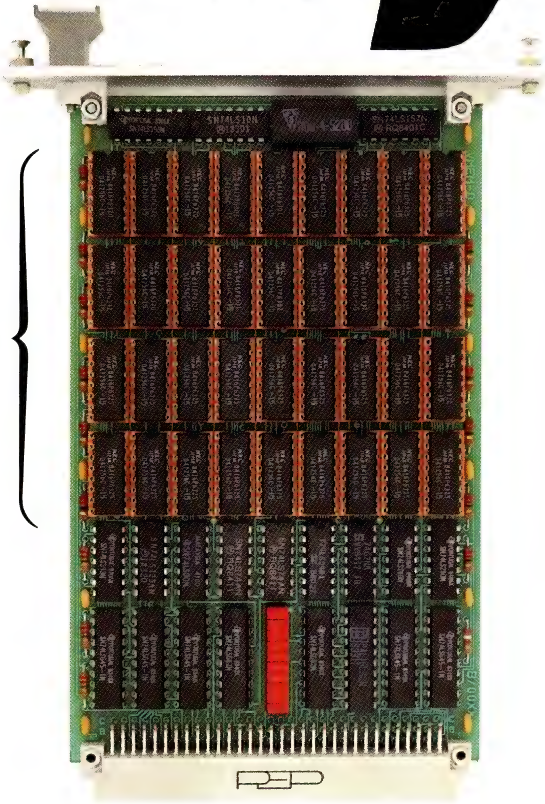

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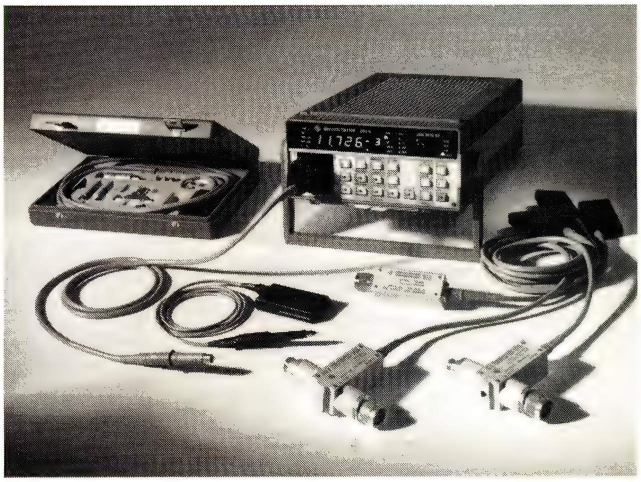
Circle 132 on reader service card

Leybold-Heraeus is offering a modular sputtering system with targets and substrates in the vertical position. The ZV 1200 is designed specifically for simultaneous two-surface coating. The vertical positioning of the substrates and cathodes ensures the simultaneous sputtering of both sides, reduced defect density due to elimination of particulate contamination, and the identical deposition area geometries to ensure indentical process and film growth on both sides of the substrate. [Circle 452]



Rohde & Schwarz's URV 5 millivoltmeter is a broadband, highly sensitive voltage level and power meter that boasts a level of accuracy, versatility, and ease of operation that was previously unattainable. Thanks to the microprocessor-controlled error correction circuitry (temperature, voltage, and frequency), the basic error is as low as ±1%. The URV 5 has two identical independent measurement channels to which one or two measuring heads can be connected. [Circle 453]

Corporate strategies: Giant Mitsubishi Electric Europe GmbH

The Mitsubishi Electric Europe GmbH expects sales to reach 385 million DM this year. Figures released by general manager Dr. Franz-Josef Stubert indicate industrial products regsitered an increase from 40 to 60 million DM, whereas revenues from electronic components more than doubled, from 30 to 70 million DM. Specifically, 40 million DM in semiconductors, 15 million DM in monitors, and 15 million DM in magnetics.

In semiconductors, Mitsubishi is an international leader in the electronics industry and employs the world's most sophisticated technology in creating random-access memories, erasable programmable read-only memories, gallium arsenide field-effect transistors for satellite communications, and linear integrated circuits for optical, video, and audio equipment. Although it has a flawless reputation for quality and precision, Mitsubishi is striving to make inprovements in the areas of technology and product quality.

In all of this, Mitsubishi is determined to continue its production of ICs and large-scale integrated devices to enhance society in so many different ways. Research and development laboratories ensure that the company maintains its leading edge in electronics technology.

Mitsubishi has a broad program on floppy disk drives—which is adjusted to the needs of the European customers—mainly concentrated on half-height 3.5-, 5.25-, and 8-in. drives. Storage capacities range from 0.5 megabytes to 20 megabytes. Also available are Winchester disk drives, 5.25-in. models holding up to 13 megabytes and 8-in. versions holding as much as 250 megabytes.

As a pioneer, Mitsubishi provides color cathode-ray-tube display monitors with low, medium, high, and ultrahigh resolutions; a wide range of CRT sizes, horizontal frequencies from 15 to 65 kilohertz. It provides such options as long persistence phospher, antiglare screens, and super-high contrast for diverse applications. The corporation also leads in monochrome technology, exhibited in its line of clear, crisp CRT and TV monitors.

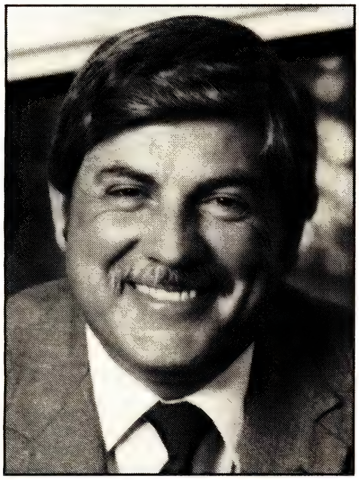
Moreover, Mitsubishi provides many types of thermal heads to meet various needs, employing both thick and thin film technologies, with a wide range of printing width and resolutions from 3 up to 16 dots/millimeter.

The European headquarters of this traditional Japanese enterprise is currently constructing a new building in Ratigen near Düsseldorf and intends to move into this building some time next year. Experience from tradition, combined with the claim of being "the first among many " is the maxim of Mitsubishi's corporate policy.

GENERAL ELECTRIC IS ON TARGET WITH SECOND SHOT AT CHIP MAKING

Research Triangle Park, N.C.

Not long ago, General Electric Co.'s chairman John F. Welch Jr. announced that the firm would not remain in markets where it had no promise of commanding the No. 1 or 2 position. True, it will be some time before GE achieves such a feat with its custom and semicustom integrated-circuit lines. Nonetheless, the firm's Semiconductor Business Division is on a course that may lead to sales of $300 million and its first year in the black.



Take two. General Electric returned to chip making to keep its products competitive, says James E. Dykes, of the semiconductor division.

The division has been toiling quietly to accumulate the resources needed to make GE a name in semiconductors. It isn't publicizing its efforts, however, since the move represents something of a change of heart: the firm retreated from the market a decade ago, explains its vice president and general manager, James E. Dykes.

At that time, GE withdrew from many sectors of the computer business because of mounting competition from IBM Corp. "That was a mistake, as the IC market subsequently exploded," admits Dykes. To make it worse, just as GE departed, some of its fiercest rivals, such as Siemens and Hitachi, entered.

Back in. "We simply had to get back into the technology to keep our products competitive," he notes. Dykes came to GE from Harris Corp.'s Semiconductor Division in 1980. The division he heads now embraces five GE departments, 6,000 employees, and three product lines: custom and semicustom ICs, discrete and high-voltage power ICs, and hybrid data acquisition components.

Since 1981, analysts estimate that the Semiconductor Business Division has been losing $5 million to $10 million annually on sales in the $200 million to $250 million range. But when the tremendous startup costs required to break into the business are considered, such losses are not unusual, says Nicholas P. Heymann, an industry analyst at Drexel Burnham Lambert Inc., who believes the division will finish the year in the black.

On sales of $300 million, he forecasts a $5 million pretax profit for 1984. ("A bit optimistic," says Dykes.) After that, he thinks, the firm should coast along. By 1986, "SBD should be exactly where GE wants it to be," showing a 10% operating profit on sales that will approach $550 million.

In following Dykes's strategy for making the company known as much for microchips as for light bulbs, GE has spent nearly $500 million during the past few years to fill holes in its technological base. In 1981, it laid out $235 million for Intersil Inc., a producer of monolithic ICs, and $7.7 million for Great Western Silicon. That was followed by the $100 million acquisition of Calma Co., a leading maker of computer-aided engineering tools.

Most recently, GE shelled out $100 million to buy the ceramics division of 3M Corp. and $14 million for the digital portion of Communications Satellite Corp.'s CAE business. In addition, some $90 million has been funnelled into research and development along with fabrication facilities, such as its ultramodern microelectronics center here.

These acquisitions were made to "serve GE's core businesses first and outside markets second," stresses Dykes. In other words, most chips made by the Semiconductor Business Division will be used captively. For example, in early 1986, it will begin high-volume production and marketing of 1.25-μm gate arrays. The technology is based on a manufacturing technique developed by GE corporate labs in Schenectady, N.Y., for the aerospace products division.

The process overcomes the physical limitations of the photolithography process by using a photo-bleachable die that becomes transparent when it is exposed to light. Thus, a circuit's line widths can be etched more easily and with better control.

If anything hurts the division, it will be its emphasis on internal needs, remarks Heymann. "If there is a pinch, that could leave SBD's outside customers wondering who will come first—GE or them," he says. But the firm appears to be addressing that concern by signing on second-source suppliers. Dykes has already inked an agreement with LSI Logic Corp., Milpitas, Calif., and is negotiating with a few others.

Major thrust to come. Although Dykes' plays down GE's interest in merchant markets, analysts sense that the semiconductor division is readying for a major commercial thrust. The GE division can offer everything from design tools to custom-configured packaging. Moreover, turnaround time is reportedly just two to three months. As further evidence, Dykes says GE will unveil its standard-cell library for 2-μm chips at November's Wescon.

Last year, the division sold only $1 million worth of gate arrays. But with the evolution to standard cells, sales should jump to between $10 million and $15 million in 1984, and double annually thereafter, predicts

Andrew Profitt, an analyst with Dataquest Inc., San Jose, Calif. "SBD has all the technological ingredients to become a major player in the applications-specific IC market," adds Profitt. Currently, GE is among a handful of U.S. companies delivering 2-μm double-layer gate arrays.

"But in this business price and performance is not enough . . . the name of the game is service, service and more service," Profitt says. To address this, the semiconductor division reduced its independent worldwide distributorships from 47 to 15 earlier this year. Each one will market all the division's wares, rather than specializing in one line. Following an industry trend, each distributor's office will also be used as a design center for division customers.

Though the division has taken strides in technology and service, it still lags in marketing. GE needs to deliver its message at industry conferences, seminars, and trade fairs, where it hardly ever shows up, reports William Strauss, an industry watcher at In-Stat Inc., Scottsdale, Ariz. The firm also needs to polish its public relations act. "Like IBM, GE has to focus on selling a high-tech image, and not just a product," he suggests. **–Karen Berney**

Computer Consoles posts sales gains with an elaborate multiuser system

Rochester, N.Y.

Firmly rooted as the leading U.S. supplier of computerized telephone-directory-assistance systems, Computer Consoles Inc. is using two acquisitions as a springboard into the office automation market. But unlike computer makers that strive to put a work station on every desk, it aims at vertical markets with a system that can be used simultaneously for a variety of functions by several departments in a company.

"They're the only true office-automation-system supplier. They're in a niche by themselves," says Patricia Seybold, editor of "Seybold Report on Office Systems." For example, with a CCI Officepower system, an executive with little computer know-how can write a memo on the same program and keyboard a legal secretary would use to prepare a complex contract. By switching modes, administrative duties such as scheduling meetings can be performed.

Sales jump. From July 1983, when it was formed, to July 1984, CCI's Office Systems Group, in Reston, Va., booked $40 million to $50 million in sales. With that plus its Telephony Group's directory-assistance systems and related products—such as audio-response systems, which save operators time by letting a computerized voice give phone numbers—CCI's revenues jumped to $63.3 million for the first half of 1984. This is up from $37.3 million for the same period in 1983. Net income increased to $4.1 million from $600,000.

Even so, CCI president Vaemond Crane resigned last month. The firm says the main reason is that he never moved to Rochester and no longer wanted to commute from Arizona; he remains a consultant. In the view of Clifford Higgerson, an analyst with L.F. Rothschild, Unterberg, Towbin, New York, the 45-year-old Crane and chairman Herman Affel, 65, are two strong-willed men with clashing management styles.

Whatever the cause, Higgerson thinks that Crane's departure will have little long-term effect. "CCI has one of the strongest technologies I've seen. It's got a life of its own. My 10-year-old could come in and run it."

Meanwhile, Ed Scott, director of customer marketing, has also resigned. Scott, said to have been crucial in securing many CCI orders, founded a firm that CCI acquired last year to serve as its base for the new division along with RLG Corp., a software firm. In his new job at Dest Systems Inc., Milpitas, Calif., Scott oversees the development of an image-processing system. As evidence of his faith in CCI, he says that he retains "a considerable number of stock options."

Help. As CCI expands, chairman Herman Affel hopes it can acquire a firm with a similar sales staff and one that is a developer of software.

At an average price of $500,000, Officepower is used by government agencies, financial service companies, and law firms. According to John McNulty, vice president and general manager of Office Systems, CCI plans to grow the division faster than the corporation," expected to increase sales by 35% a year.

The group was responsible for 10% of sales in 1983 and is expected to generate up to 30% in 1984. Customers include Merrill Lynch Asset Management Inc., Hale and Dorr, a large law firm located in Boston, the U.S. Army and Navy, and New York Life Insurance Co.

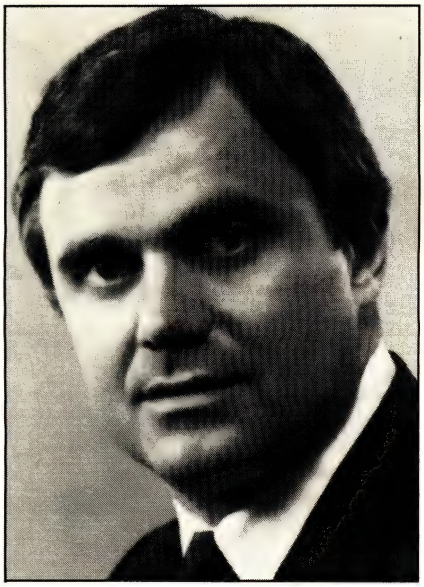
With such contracts, technical support is crucial, so CCI maintains a sales-to-support staff ratio of 1:1. This, McNulty feels, along with supplying all hardware and software for a multitasking system, gives his firm an edge over most others, whose customers might have to call several companies for service. "People want someone to own their problem."

No windows. Though it has a range of attributes, Officepower lacks windowing software and business graphics. It is Unix-based, but not yet MS-DOS compatible. Next year, it will have an MS-DOS-compatible mode and graphics "as good as anybody in office automation," says Jeffrey Tai, senior vice president, Products Group.

Using CCI's directory system, marketed by its Telephony Systems Division, operators can retrieve a number and address in seconds with eight keystrokes. The company thinks the 1984 market for the system is $300 million.

The market for its other telephone-related products will be twice that. Other Telepower products enhance CCI's directory-assistance systems. For example, one product lets a business give a number to an operator and obtain a name and address for checking credit.

Last year, CCI signed a $34 mil-



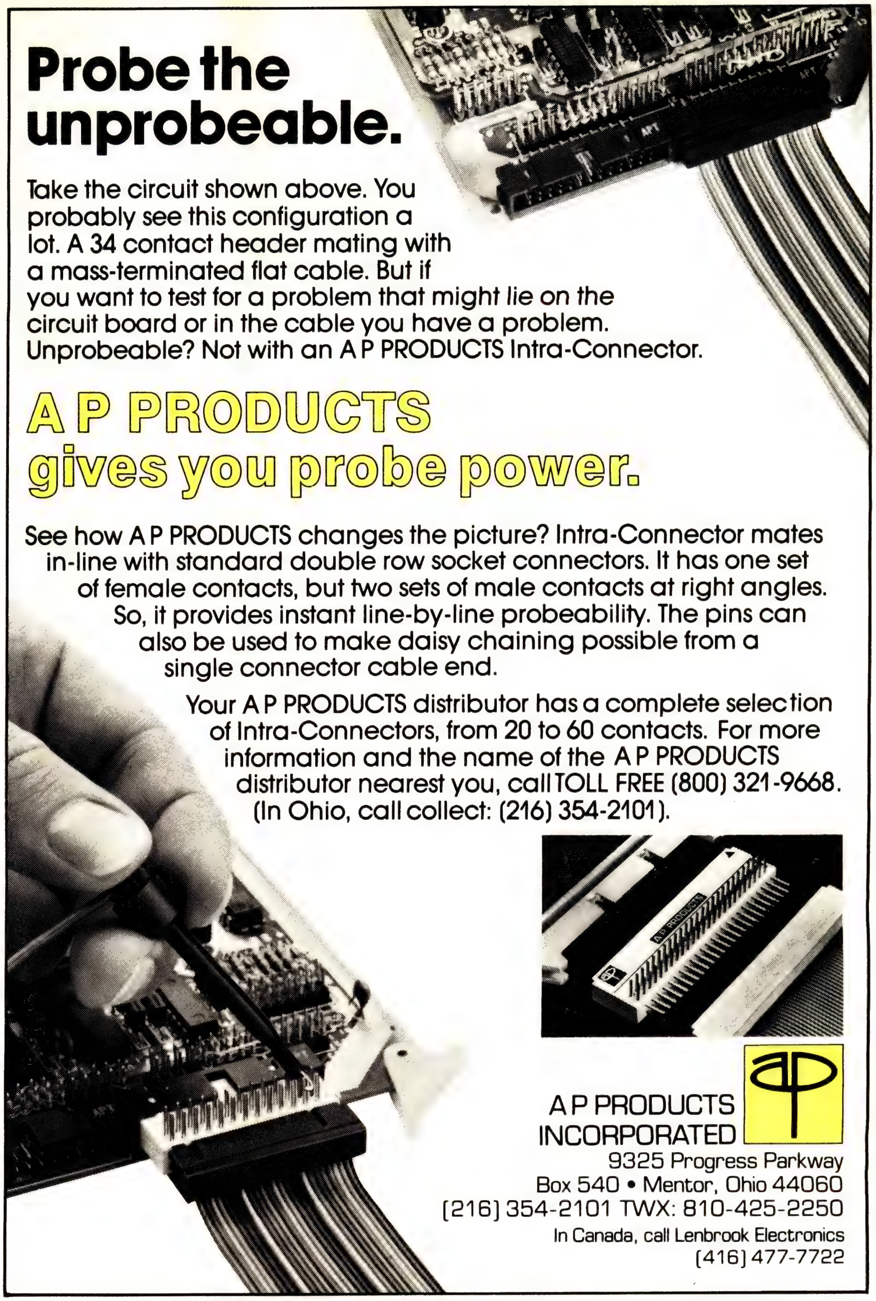
Support. "People want someone to own their problem," remarks John McNulty, general manager of CCI Office Systems Group.

lion contract with Standard Telephone and Cables, London, for directory-assistance systems. STC will supply the equipment to British Telecom, which has a data base of 22 million telephone listings, the largest in the world. In Paris, a firm called Unixsys sells Officepower networks after making them hardware and language compatible with French systems. "We expect in the months ahead to have other distributors in Europe," explains McNulty.

To ease any growing pains the company might experience, Affel says CCI hopes to acquire two companies—one with a similar type of sales staff, the other with expertise in software development.

As the base for both group's lines, CCI has developed Perpos, a Unix-compatible operating system and two series of minicomputers. Power 5 is based on Motorola's 68000 and can be upgraded to a offer fault tolerance and distributed processing. Power 6, a superminicomputer, employs a 32-bit processor developed by CCI's Commercial Products Division in Irvine, Calif. "The Power 6/32 is five times more powerful than VAX [11/780], it costs about the same, and it's Unix-based," says Higgerson.

This year, CCI will spend approximately $20 million, or 18% of sales, on research and development. "I've never seen as many resources committed to R&D," says industry-watcher Seybold. –**Steve Haggerty**



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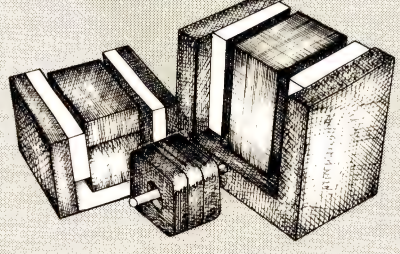

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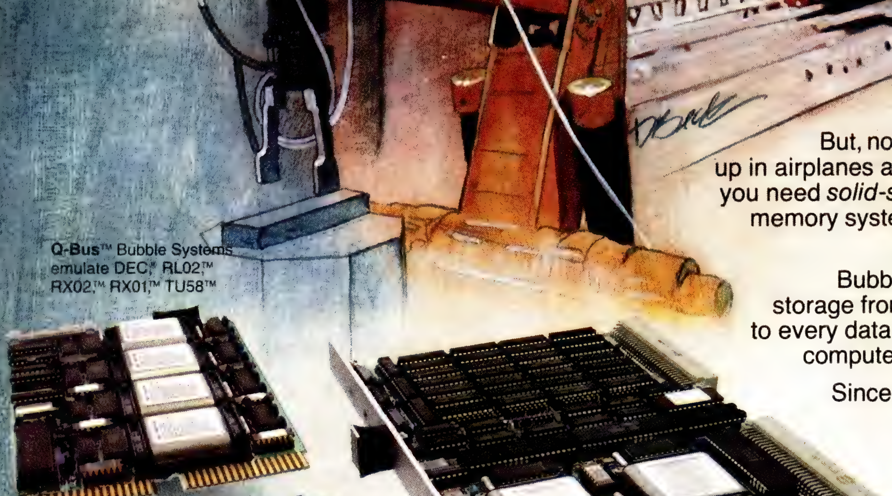

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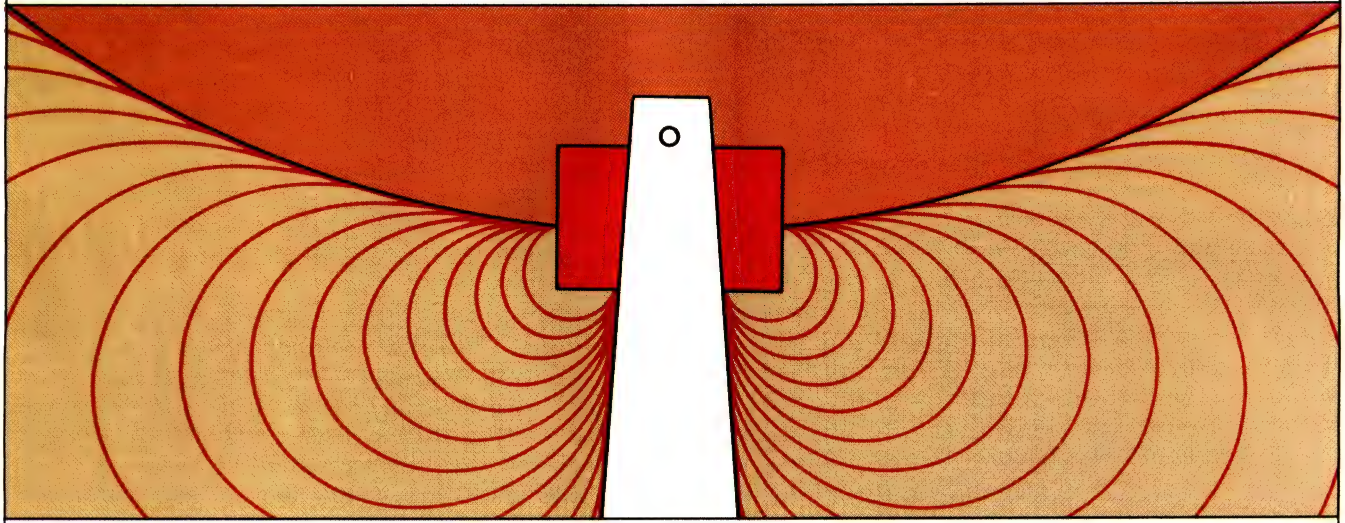
Circle 54 on reader service card

SPECIAL REPORTS

MAGNETIC MASS STORAGE DENSITIES RISE

Innovative head designs, new media, and perpendicular recording collectively promise to revolutionize mass storage

☐ *by Robert Rosenberg*



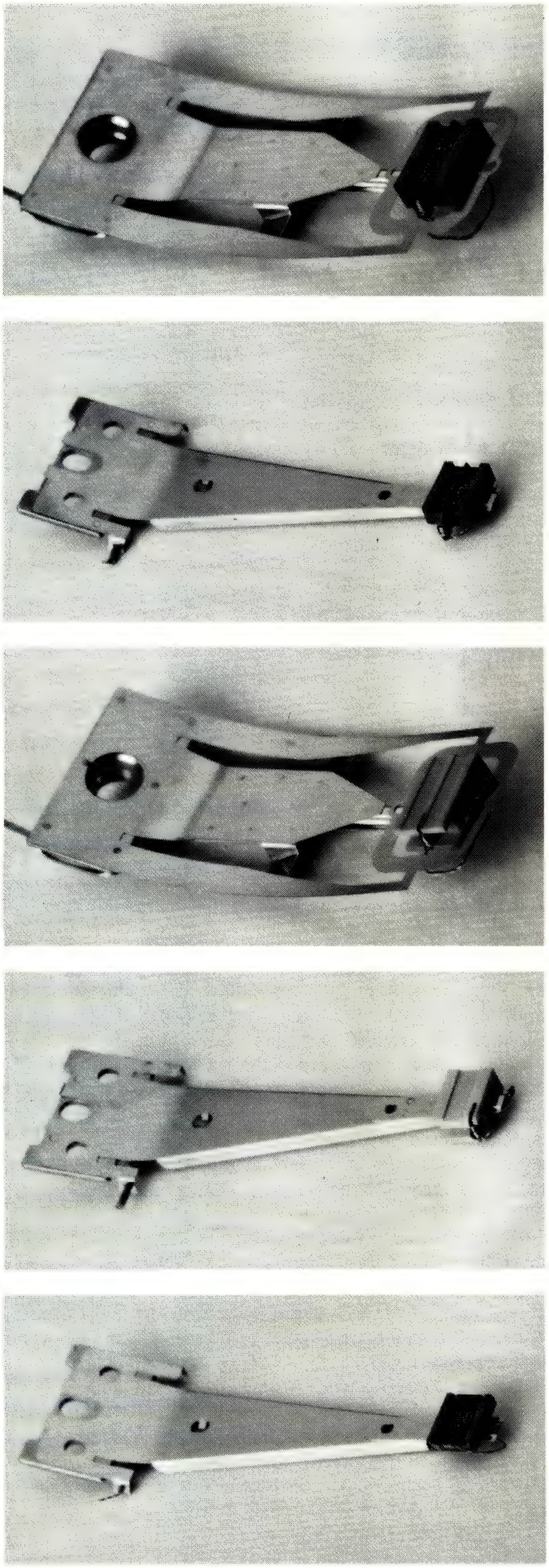
Commercial computing grew up with magnetic storage, the mainstay of computer memory since its inception. Indeed, that technology has never had a serious challenger. But the companies working in this arena know they cannot afford to rest on their laurels: as computer architectures migrate to memory-hungry multiple processor systems and network servers, computer-aided design work stations, and private branch exchanges, users will demand more memory in smaller packages. Only those manufacturers ready with memory products that can match the performance of the new systems will survive.

Magnetic storage is readying a potent combination punch: better head technology, new recording materials, and novel recording techniques that will keep pace with the computer's insatiable appetite for greater densities and faster access times. With optical storage about to enter the fray, the mass-storage champions are quickening the tempo of research and development as well as feeling an increased sense of urgency about moving technology into production.

Innovations in recording-head design and fabrication, new recording materials, and new recording techniques all promise to reduce the length of magnetic domains, or cells, dramatically, so bits can be packed together more closely. Several ways of getting higher areal densities—the measurement of bits per square inch, calculated by multiplying tracks per inch by the linear density measured in flux changes per inch—have been developed.

One method is to improve the recording head's performance, squeezing the maximum number of tracks per inch from the recording medium. To do so, every effort is made to reduce the width of the ring head, the active region that writes a series of flux reversals onto the recording medium's active layer. Since the fringing field falls off 50% at a distance comparable to the gap length, both the medium's thickness and the head's flying height must be reduced proportionately. However, if the total volume of the conventional medium—ferric oxide dispersed in a binder to make it adhere to the substrate—is reduced too much, the signal-to-noise ratio decreases to unacceptable levels.

Doping the ferric oxide with highly anisotropic material to increase its coercivity only partly solves this problem, because the ferric oxide must still be laid down in a relatively thick manner (35 μin.). But when a continuous film about 3 μin. thick, consisting only of magnetic particles, is laid down on the disk (either with plating or sputtering techniques), additional magnetic material can be packed into a given volume, so bit densities can be



1. Evolving heads. The evolutionary march of rigid-disk-head technology begins as the mass of the full-size monolithic head and slider (top) is reduced in the minimonolithic slider. Head protection in the full-size composite and minicomposite sliders make possible smaller gaps and increasing track densities. Thin film heads offer even finer tolerances in core geometry without mechanical assembly problems.

more than doubled without any appreciable loss of signal amplitude.

If the longitudinal cells, which generally demagnetize themselves, can be reoriented so that their fields tend to reinforce one another as the boundaries are made smaller, an order-of-magnitude increase in density is possible. This is the promise of perpendicular recording.

The long march

Most advances in recording-head technology first showed up in high-performance 14-in. drives, but the technology has migrated downward into the 8-in. level and below (Fig. 1). The first lowering of the 40-to-45-μin. flying height of the read/write heads used in the original Winchester drives occurred when the machined ferrite core integral with a full-sized monolithic slider was replaced by a lower-mass, minimonolithic slider using the improved Whitney-type suspension. This enhancement offered a flying height in the vicinity of 10 to 20 microinches, as well as quicker access times, but kept the upward boundary of readability at about 1,000 tracks per inch.

Full-size composite heads, consisting of a small ferrite or zinc core bonded to a ceramic slider, offer greater protection to the core. The gap can therefore be reduced without introducing reliability problems, and this makes possible track densities of about 1,500 tracks per inch.

"Monolithic and minimonolithic are our big products," says Chriss Aho, director of marketing at Applied Magnetics Corp., Goleta, Calif. "The industry ships about a half million monolithic heads a week [while] volume shipments of composite heads are running at 10,000 to 20,000 weekly."

Meanwhile, E.T. Bahre—chairman of Computer and Communications Technology Corp., Santa Barbara, Calif., whose subsidiary, Information Magnetics Corp., straddles both camps—claims to be shipping 75% to 80% of the composite heads the market requires. Bahre also indicates that half of Infomag's shipments consist of composite-type heads. Looking at thin-film technology, Bahre says that "composite stores about as much as low-end thin film and is inherently cheaper to make. It's a proven technology."

An impressive demonstration of 3,000-track/in. tracking technology took place at this year's National Computer Conference, in Las Vegas. Infomag's minicomposite slider, mounted on a Whitney-type flexure, was teamed up with a precision tracking-motor technology developed by LaBudde Engineering Corp., Westlake Village, Calif. A tiny tracking motor, with the heads riding on top, mounts directly over a conventional positioning arm, which handles the long stroke positioning while the tracking motor provides the precision positioning.

Thin-film heads—which first flew above an IBM 3370 drive in 1979—are still confined largely to the 14-in.-drive market. With a bit of help from techniques pioneered by semiconductor manufacturers, the use of thin-film technology means that finer tolerances in the core geometry can be achieved; in addition, the constraints imposed by mechanical winding, machining, and assembly are eliminated. “I expect to see thin film in the 5¼-in. and smaller drives, but it is really a price/performance problem, not a problem of technology,” says Jon Widdowson of Dastek Corp., Los Gatos, Calif., a manufacturer of thin-film heads.

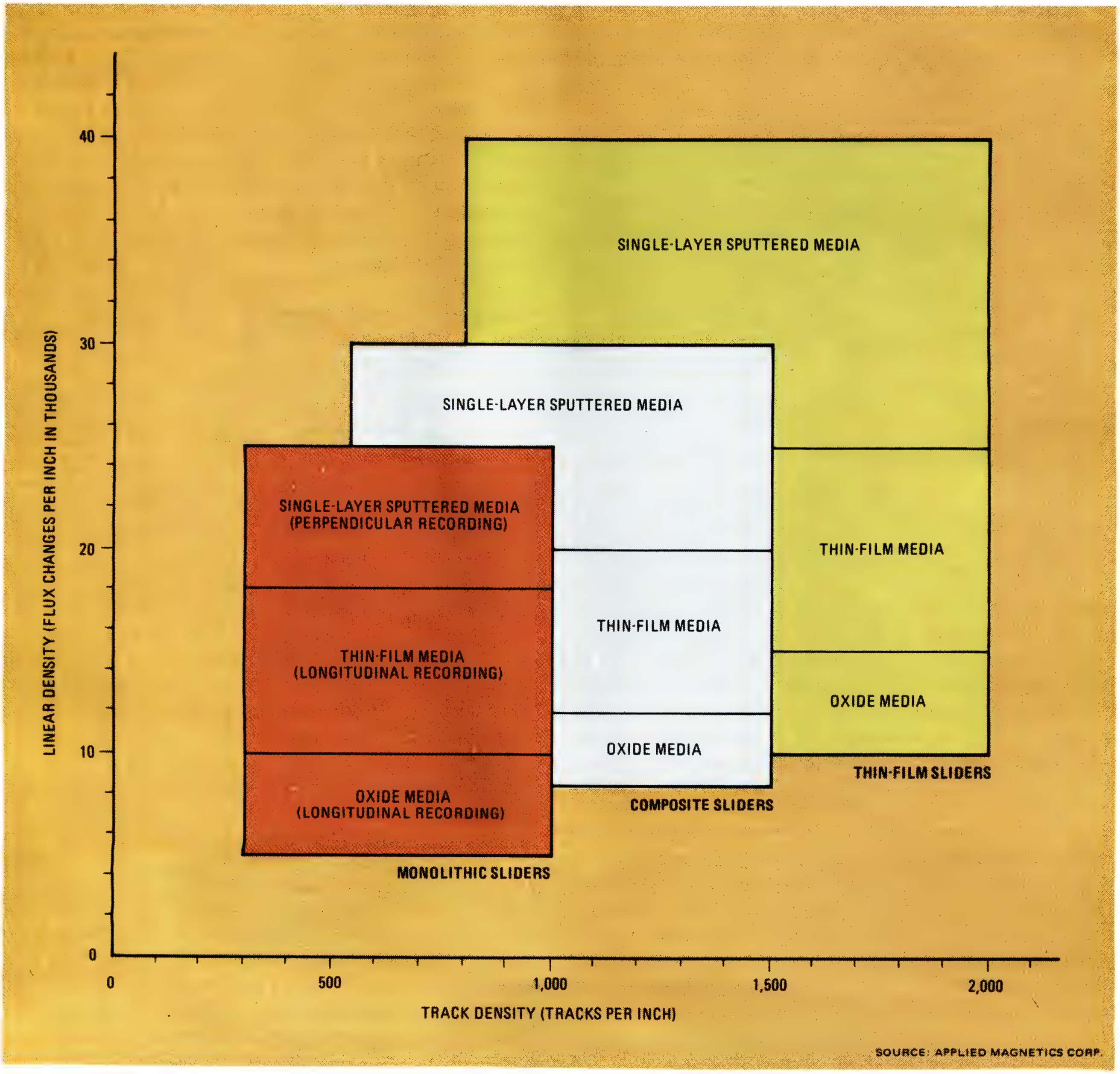
Siemens Communications Systems Inc., Westlake Village, the German manufacturing giant’s marketing arm, is not waiting for the competition; it will introduce a 5¼-in. Winchester using thin-film heads and disks at November’s Comdex show, in Las Vegas. The mechanical aspects of the drive are innovative, too. Based on eight years of research and extensive use of robot assembly, the design employs bearings to support both the top and bottom of the spindle, as well as a spindle motor housed outside the head-disk assembly. (The producer claims that this arrangement is advantageous when it is necessary to break and cope with static discharge.) The high-end product stores 254 million formatted bytes and has an average seek time of 25 ms.

No vacuum

Head technology does not operate in a vacuum. New recording techniques and new media also promise to bump up their part of the areal-density equation (Fig. 2). One hotbed of magnetics research is the University of Minnesota’s new Center for Magnetics and Information Technologies, in Minneapolis, where Jack H. Judy and his colleagues are excited about the bit densities that are possible with perpendicular recording techniques.

“Perpendicular recording represents a quantum jump

2. Areal densities. Advances in head technology, in combination with new media and recording techniques, promise to increase areal densities dramatically. In the future, thin-film heads and perpendicular media will yield as much as 80 Mb/sq. in.



SOURCE: APPLIED MAGNETICS CORP.

WHO'S WHO IN HIGH-COERCIVITY MEDIA

Company	Location
Oxide	
Brown Disc Manufacturing Inc.	Colorado Springs, Colo.
Charlton Associates Inc.	Irvine, Calif.
Dysan Corp.	Santa Clara, Calif.
Kearney-National Inc.	New York
Nashua Corp.	Nashua, N.H.
Plated	
Ampex Corp	San Jose, Calif.
Burton Magnekote Inc.	Culver City, Calif.
Datapoint Corp.	Mountain View, Calif.
Domain Technology	Milpitas, Calif.
Eikon Inc.	Simi Valley, Calif.
Ibis Systems Inc.	Duarte, Calif.
Information Memories Inc.	Santa Clara
KSI Disc Products Corp. (subsidiary of International Memories)	Santa Clara
Media Technology Corp.	San Jose
Megastor (Tandon Corp.)	Chatsworth, Calif.
Memorex (Burroughs Corp.)	Westlake Village, Calif.
MicroDisk (SyQuest Technology)	Fremont, Calif.
Polydisk Systems Inc. (National Micronetics)	Torrance, Calif.
Tandon Corp.	Santa Clara
Ultra Disc	San Jose
Xerox Corp.	Stamford, Conn.
Sputtered	
Akashic Memories Corp.	Santa Clara
Anelua Corp. (NEC)	San Jose
Applied Information Memories	Milpitas
Cyberdisk Inc.	Anaheim, Calif.
Fujitsu America Inc.	Santa Clara
Gemini Research	Fremont
Grenex Inc.	Fremont
Hewlett Packard Co.	Boise, Idaho
Komag Inc.	Milpitas
Lanx Corp.	San Jose
MicroDisc (SyQuest Technology)	Fremont
Lin Data Corp.	Santa Clara
Oktel Corp.	Campbell, Calif.
Trimedia Corp.	Fremont
Vertimag Systems	Minneapolis

over conventional recording because it offers an order-of-magnitude increase in density over [traditional] ferric oxide media," he says. In longitudinal recording's magnetic cells, adjacent poles are oriented similarly and thus have demagnetization characteristics. But the orientation of adjacent cells in perpendicular recording is in opposition, so the fields tend to reinforce one another. What's more, the perpendicular orientation also produces a more sharply defined cell boundary, which lets cells shrink in size.

John C. Mallinson, recently named the first director of the new Center for Magnetic Recording Research at the University of California at San Diego, is not so sure. He has compared data published by Hitachi and Fujitsu, which have used a sputtered cobalt-chromium metallic film for perpendicular recording, with data from Ampex and NEC, which are looking at longitudinal recording using plated cobalt-phosphorus and cobalt-nickel, respectively. These researches leave him with the feeling that there is little relative advantage between longitudinal and perpendicular recording techniques.

Judy in turn wonders if the Mallinson study might not have turned out differently had he used a head optimized for thin-film perpendicular recording. Mallinson stands by his analysis. He says the obstacle to reaching the higher densities is keeping the noise the head generates within acceptable limits as its flying height drops to accommodate the new media.

Lanx Corp. is one of the leaders in perpendicular-recording technology. Currently, the firm is shipping evaluation 5¼- and 8-in. cobalt-chromium single-layer-thick sputtered rigid disks certified to record 30,000 flux changes/in. imposed on magnetic domains using conventional composite head technology. According to Barbara J. Langland, marketing director for the San Jose firm, "We have recorded on a single-layer disk as high as 70,000 flux changes/in., but there is really no market yet for this kind of product."

Brown Disc Manufacturing Inc., Colorado Springs, which is producing high-capacity 5¼-in. floppy disks using conventional longitudinal-recording techniques, plans to start looking at vertical recording using particulate technology, not thin films, says president Ben Brown. Vertimag Systems, Minneapolis, finds the "very sloppy tolerances on the mechanical aspects" of the 5¼-in. form factor an obstacle to manufacturing high-capacity drives; it is therefore abandoning this approach and working on a 3½-in. perpendicularly oriented *diskette* using sputtered cobalt-chromium, says Clark E. Johnson, the company's president. As an example of the 5¼-in. form-factor slop that is unacceptable in high-capacity storage, he cited center spindle runout of ±1 mm for a 5¼-in. drive as compared with a 200-μin. tolerance for its 3½-in. counterpart.

Great debate

A debate turns on the precise returns that can be anticipated from the new recording techniques. Yet established disk drive manufacturers seem more inclined to hike the areal density of their products by tweaking established technologies to increase the number of tracks per inch than by trying to win dramatic increases in flux changes per inch by adopting costly thin-film heads, new media, and perpendicular recording.

For example, in mid-October Shugart Corp., Sunnyvale, Calif., announced it had doubled the capabilities of its 10-megabyte half-height 5¼-in. Winchester drive, to 720 tracks/in., by using a closed-loop servo positioning system in which servo data embedded in the track is used to position the head more accurately than would be possible in an open-loop servo system. "We are not pushing the areal-density limits with our oxide-coated product, but in two or three years we might look at" thin film and perpedicular recording, says Thomas Jarrett, Shugart's director of product marketing.

One reason Shugart and others can afford to wait and see is that conventional gamma ferric oxide disks, used since the inception of mass storage, were given a new lease on life last year, when cobalt-doped gamma ferric oxides were introduced. The eventual demise of these disks, however, is a foregone conclusion. The only question is when.

Because cobalt is highly anisotropic, if it is added to the traditional gamma ferric oxides, it increases the medium's coercivity, providing twice the capacity of conventional oxide rigid disks, according to Dysan Corp., Santa Clara, a leading supplier. The chocolate oxide, so called because of the rich brown color cobalt doping imparts, increases the coercivity of ferric oxides from the 300-Oe range to 600 Oe, with yields of 15,000 flux changes/in. "Our biggest problem is keeping up with demand" in today's market, says Gary Snyder, a Dysan marketing manager, acknowledging that in a year or two, this may change dramatically.

Some industry leaders predict that the switch from ferric oxides to thin metallic films could be complete as early as 1985. The most self-assured voices come from those working on thin metallic films. At the recently concluded DataStorage 84 meeting, in Denver, a "clear message for media manufacturers was that oxide is dead, in the sense that it has virtually reached its areal limits," according to Earl H. Blevis, vice president of Grenex Inc., Freemont, Calif., a firm actively engaged in the production of thin-film media. "It's a mature situation, though some will make oxides for years to come. But, then, some people still make vacuum tubes," he added.

Density limits

T. Hunt Payne, vice president for marketing at Domain Technology, Milpitas, Calif., agrees. "Oxide media are at their areal-density limits in the range of 10 to 12 Mb per square inch." He counts more than 25 companies in the race to produce thin-film media (Table).

Stephen C. Johnson, president of Komag Inc., Milpitas, another firm involved in the thin-film-technology race, concurs with that judgment, adding that after drive manufacturers have been converted from ferric oxides to metallic media, an evolutionary struggle will determine the dominant thin-film deposition technology—plating or sputtering (Fig. 3).

3. Sputters ready. Steven C. Johnson (left) and Tu Chen, Komag Inc., believe that as drive manufacturers switch to thin-film disks, sputtering will supplant plating. Sputtering chambers (background) are expected to produce thousands of disks daily.

Right now, manufacturers shipping plated thin film are dominant, led by Ampex Corp., San Jose, the acknowledged ground-breaker in plated thin film; Magastor, a subsidiary of Tandon Corp., Chatsworth, Calif., follows behind. The Alar disks that are manufactured by Ampex and licensed to Poly-disc Systems Inc., Torrance, Calif., use electroless plating. First, the technique is used to lay down a 700-μin. nonmagnetic nickel-phosphorus undercoat that fills voids on the aluminum substrate and acts as a load-bearing surface for the flying head; then it deposits a 2-to-3-μin. 650-Oe cobalt-phosphorus recording (Fig. 4).

Ampex has maintained all along that sputtering a hardened carbon overcoat atop the recording layer, which would improve the medium's wear characteristics and lower the stiction-friction coefficient, is not necessary. "But there are perceptual factors we must face. Our customers feel more comfortable with an overcoat," says Gil M. Argentina, a marketing manager working in the Ampex Media Products Division. So the company has projects to this end currently under way, and an overcoat may be forthcoming early next year.

Sputtering is recognized by many as the wave of the

Bubble is back

When introduced in 1967, bubble memories, pioneered at Bell Telephone Laboratories by A.H. Bobeck, held such promise that many magnetic-disk manufacturers wondered if they would soon be looking for a new line of work. A nonvolatile form of magnetic storage that can survive all the heat, dirt, and vibration that bedevil many operating environments, the technology seemed a good bet for the future.

In a very thin film of garnet, the magnetic domains are oriented perpendicularly to the film. Without a magnetic field, the domains are snakelike and irregularly formed. But when a bias field is applied by permanent magnets perpendicular to the film, the snakelike domains oriented in the direction opposite the field take on a cylindrical shape even though immersed in the larger domain created by the bias field. The cylindrically shaped domains, usually less than 3 μm in diameter, are the bubbles.

A rotating field created by two coils placed at right angles in a substrate generates the film's current, which marches the bubbles along an orderly path made up of storage loops and input/output tracks. Each predefined location is either full or empty (1 or 0). If power fails and the rotating field is lost, the permanent magnets keep the orientation of the cylindrically shaped domains. To read data, a bubble is duplicated and one sent to an output while the other remains in the storage loop.

Fabrication techniques for bubble memories have followed semiconductor technology, moving from photolithography to X-ray lithography. But since manufacturing cost per bit remained too high to make them cost-competitive with disk storage, National Semiconductor, Rockwell International, and Texas Instruments dropped out of the development race. Left are Motorola, Hitachi, Fujitsu, and Intel. Intel plans to reduce the price of its 1-Mb chip to less than $100, while it continues to develop and produce a 4-Mb version.

4. Splish splash. Ready to take a bath, 720 disks are placed in plating baths at Ampex's Alar production facility. Ampex maintains that it is not necessary to sputter a carbon overcoat on top of the recording layer to improve the medium's wear characteristics.

Ampex, as well as firms with plated and sputtered capabilities, is gearing up for what will be a fierce battle for market advantage. The most commonly touted benefits of sputtering are that a wider coercivity range of materials (600 to 1,200 Oe) can be selected and implemented without much downtime to a manufacturing line, alloys can be selected for their corrosion-resistant properties, overcoat adhesion is better than it would be in a two-step plating/sputtering process, and the final product shows almost no asperities when compared with a comparable plated disk.

"Plating is economically viable now. Sputtering is only starting to become viable," says Hunt Payne of Domain Technology. The firm's plans call for an orderly migration from plated, to plated with a sputtered overcoat of carbon, to full-sputtering technology (Fig. 5).

Such firms as Circuits Processing Apparatus, Fremont, Calif., Varian Associates, Palo Alto, and Leybold-Heraeus, East Germany, have a leg up supplying the vacuum technology used to sputter thin films. One new start-up, Grenex, is going a different route. "We are building our own equipment, which is dramatically different from anyone else's," says Earl H. Blevis. He is tight-lipped about the process, saying only that it uses different magnetic alloys and that the firm will introduce perpendicularly oriented thin film as well as both single and double-layered vertically oriented thin film.

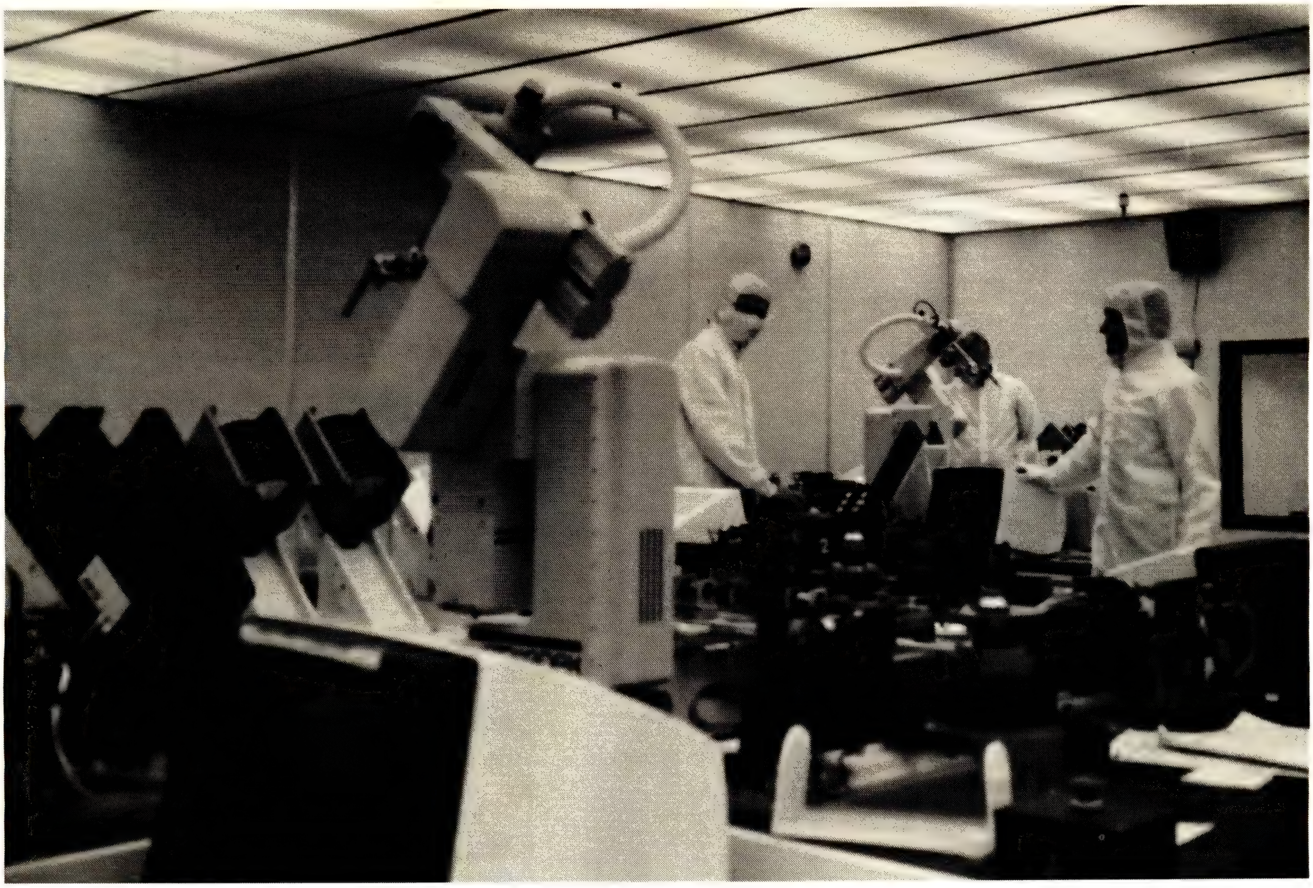
When drive manufacturers look at new recording technologies, the bottom line is consistency of yields and availability of product. The travails of Vertex Peripherials Corp., San Jose, formed in 1982 to take advantage of the revolution in magnetic-recording technology, provides a glimpse of the problems encountered as new technologies move from the laboratory to the manufacturing floor.

Hard choice

"We started off using a plated metallic thin-film medium because of its durability, better signal-to-noise ratio, and higher densities," said James Adkisson, executive vice president. But 18 months ago that meant being locked into a single source, so the firm switched to high-coercivity oxides. Again they had to depend on a single source of supply. "We found high-coercivity oxide wasn't readily available either, so by the end of 1983, with metallic coming on line, we came back to metallic."

"Early on, we found that yield-to-specification was difficult to achieve." He notes that manufacturers of cobalt-doped ferric oxides tend to have problems controlling magnetic properties and media defects, while most plated thin-film problems are related to the media's mechanical aspects, particularly asperities created in laying down the carbon overcoat. Acceptable quality yields range from 60% to 90% in any given shipment, notes Adkisson. "But the swing is getting better and better and may go up soon to 80% on the low end within the next few months."

Those developing new recording media have their own set of problems. In a challenge to Winchester technology, 3M Corp., Minneapolis, announced its stretch-surface re-



5. Robots ready. Gearing up for sputtered thin-film production, the clean room at Domain Technology is being outfitted with robots. Management's plans call for extensive use of robots to speed production and keep human contamination to a minimum.

cording medium at the 1983 Fall Comdex, in Las Vegas. The company claims that the web-formed flexible skins, stretched across a composite polymer substrate, could perform like a Winchester disk but cost only about as much as a floppy.

Skin tight

Small ridges at the injected molded substrate's outer and inner diameters form the attachment points for the new proprietary polyester film, shown at the show with a 600-Oe ferrite coating similar to that used in 3M's 5¼-in. floppy disk. But according to James R. Packard, laboratory manager for the project, in St. Paul, the new medium can be coated with any of the popular isotropic or metallic pigments, longitudinally oriented thin films, or perpendicularly oriented cobalt-chromium metals. The demonstration used a 5¼-in. drive modifed to fly at 5 μin. above the disk's surface.

Bit-error rates attributed to media defects are kept well within the range accepted for Winchester disks. Because the medium is flexible, track anisotropy is a concern, but tests conducted by the producer show that only a 5% to 10% reduction in density (as compared with a hard disk) can be attributed to the medium's flexibility. The trampoline effect caused by the stretching of the polyester across the disk makes it hard enough to withstand a substantial amount of shock.

Another 1983 National Computer Conference announcement that is late out of the gate is the Isomax particle technology, which Eastman Kodak Co., Rochester, N.Y., promised for floppy disks in volume shipments by the end of 1983. The firm touts the proprietary process as the first commercially available medium that would support perpendicular-recording techniques. It reportedly produces 0.2-μm particles that can be packed more closely than other oxides doped with cobalt—and they possess complete isotropy.

But because cobalt exhibits a temperature dependence that affects the medium's coercivity, researchers are still at work trying to get the maximum density forced by the temperature-density tradeoff. "We feel quite good about the research," says Rodger Van Heyningen, an assistant director of research, but no promises have been made about deliveries.

Meanwhile, in Armonk, N.Y., IBM Corp.'s 200-megabyte 3480 cartridge tape drive—dubbed the Del Oro—has been built around a ½-in.-wide chromium oxide tape housed in a 200-megabyte cartridge that measures 4 by 5 by 1 in. Its linear density is 38,000 bytes/in. using 18 thin-film heads to write a like number of parallel tracks in 24-K blocks; thus it can easily handle 6,250-bit/in. 4-K-byte blocks or larger—formats used in the standard 10½-in. reel-to-reel tape.

"IBM adopted a tape that was state of the art six to eight years ago," says John Mallinson. But because the packaging itself is small and can be readily placed in a jukebox arrangement for quick handling, the Del Oro will shrink the area required to store tape, making it appropriate for use as the back end of a mass-storage subsystem. ☐

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VLSI TESTERS HELP GUARANTEE CHIP QUALITY

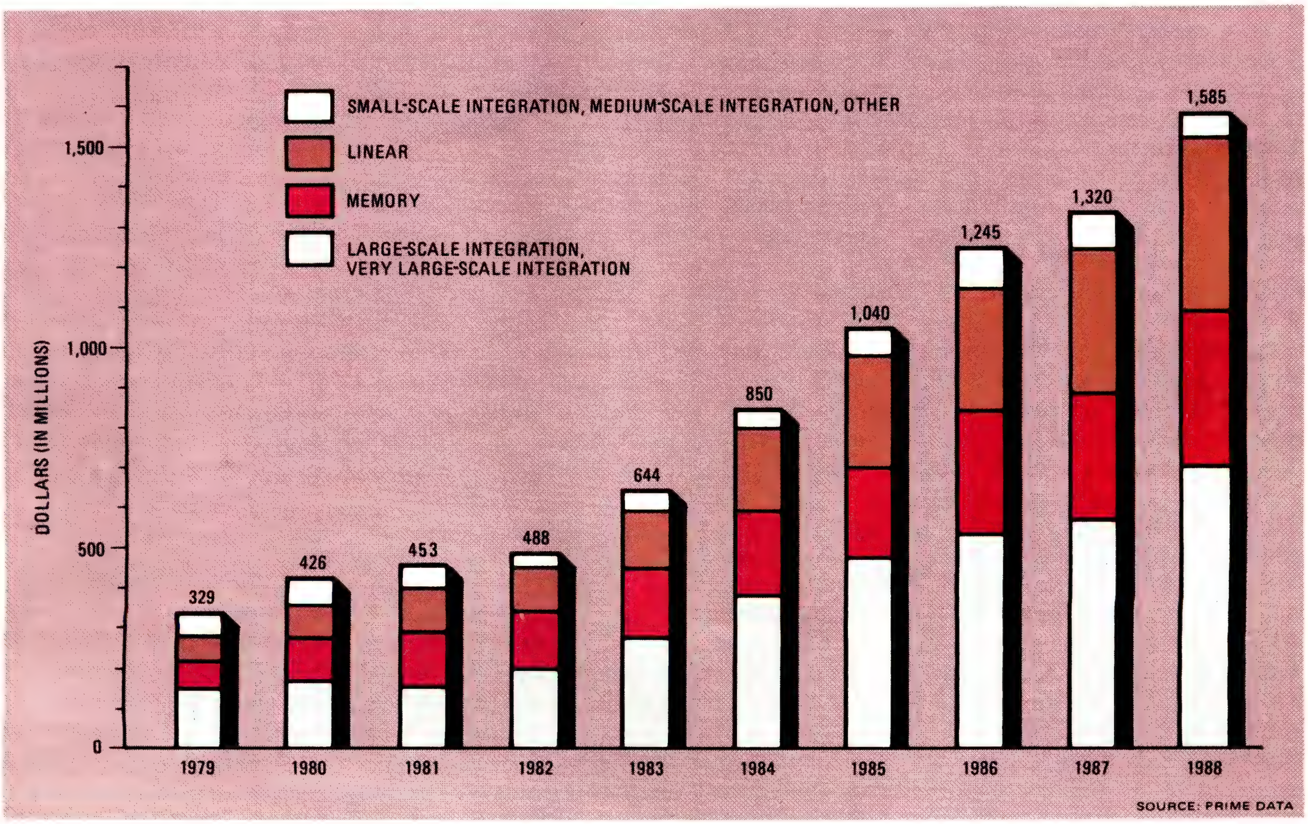
The use of very large-scale-integration testers during manufacturing makes it possible to produce quality chips at low cost

☐ *by Scott Kline*

Semiconductor production volumes continue to increase as prices per function continue to drop. Spurred by the Japanese, recent competition has also put new emphasis on high-quality products. As a result, cost-effective and truly excellent test equipment is now essential.

Since the cost of testing is related to the number of components on chip and to the accuracy with which they are tested, these requirements are difficult to satisfy. Moreover, the marketplace has become diverse, with many degrees of complexity, many technologies, and many applications. Testers cannot be unspecialized; they must address specific segments of the market.

The semiconductor test marketplace can most usefully be divided into two main areas of circuit operation: linear and digital, with the latter being further divided into logic and memory segments. Logic chips—including microprocessors, microcontrollers, gate arrays, bus drivers, shift registers and other circuit elements—perform the actual data-processing and number-crunching that are an integral part of computer operations. Memory chips store the information used to execute or define programs, to-



SOURCE: PRIME DATA

1. Test-equipment market. The market for semiconductor automatic test equipment has been growing steadily and, considering the expected innovations in test-equipment technology, should increase even more rapidly in the next few years.

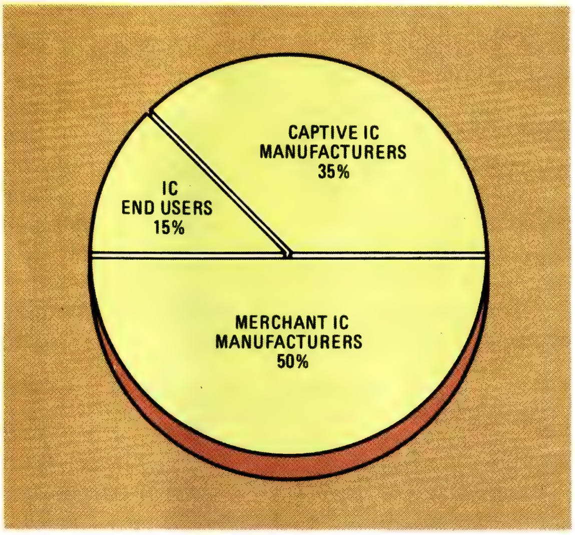
gether with the results of operations performed by the logic elements.

In 1983, the worldwide marketplace for semiconductor testing was estimated at $644 million. Digital testing accounted for about 75% of this market: memory for 30%, and logic-related devices for 45%. Linear and discrete components accounted for the remaining 25%.

The difficulty both of manufacturing and of testing logic chips increases as they become more complex. Their complexity is commonly measured by counting the number of gates on chip—the degree, or scale, of integration. Small-, medium-, large-, and very large-scale integration are the four main categories of chip complexity.

The boundaries from one region to the next are not always clear, but a general rule of thumb suggests that SSI contains up to 1,000 transistors, MSI up to 10,000, LSI up to 100,000, and VLSI more than 100,000. In 1983, purchasers of testers for LSI and VLSI semiconductors accounted for approximately 41% of total sales, or $264 million. This year, sales estimates for VLSI testers alone are in the region of $200 million.

Of the companies manufacturing VLSI semiconductors and also using test equipment, roughly 50% are merchant manufacturers, which include such companies as Texas Instruments, Motorola, Intel, and NEC, and whose primary business is to design, build, and sell semiconductor chips. Product designs from within the company are sold on the general market in the form of off-the-shelf microprocessors, microcontrollers, and peripherals. However, an ever increasing number of products supplied by these companies are application-specific integrated circuits, such as gate arrays, standard cells, and programmable logic arrays.



2. Customer types. Most semiconductor automated test equipment is purchased by the merchant manufacturers, who design custom and standard semiconductors for end users.

Another category of merchant manufacturer comprises custom houses. These firms will design a chip at the request of a specific customer, who presents them with design specifications and relies on their expertise and equipment to build what is needed.

Captive manufacturers—including, IBM, Digital Equipment, and AT&T—make up a second type of test-equipment user. These manufacturers not only build semiconductors for use within their own organizations, but they also buy large quantities of semiconductor chips from the merchant manufacturers. As a result, their test requirements resemble both those of manufacturers as well as of end users, and consequently their testing needs are usually quite diverse.

Many of their chips are task-specific and therefore nonstandard. Since these parts are proprietary and customized, their manufacturers are quite often required to produce specialized test equipment in-house. Special technologies are purchased from the outside and must be tested during incoming inspection.

Because of the proprietary nature of products in the captive market, it is hard to measure the size of the demand for testers in it. However, it makes up about 35% of the market for VLSI testers and is increasing.

Incoming inspection is a third major use for VLSI test equipment. Purchasers of semiconductors have traditionally wanted to assure themselves that the products coming through their doors are of high quality. However, two factors will reduce the need for incoming inspection in the VLSI test market.

First, more complex chips will require more expensive testers, which will keep smaller-volume chip buyers from making large tester investments. Second, semiconductor manufacturers are reducing the need for incoming inspection because they are making extensive tests before they ship products and are committing themselves to even more aggressive quality goals. The incoming-inspection market, which accounts for roughly 15% of the VLSI test market as a whole, is continuing to decrease.

Because of the different technologies employed in semiconductor design, it is very hard for one tester to address the full range of VLSI parts and still maintain a high level of performance. Different operating characteristics mean that these technologies present unique and challenging test problems.

The bipolar and emitter-coupled logic technologies, on the one hand, and the MOS and CMOS technologies, on the other, make up more than 99% of the current semiconductor market. Both memories and logic chips can be made from either technology. However there are some significant differences between and within both.

The MOS-CMOS group is used in more than two thirds of all semiconductors sold today. N-MOS accounts for almost half of total sales. With this process, a manufacturer can achieve high packing densities at a relatively low cost. Moreover, n-MOS parts are generally rugged and inexpensive—which is why they are so popular.

Unfortunately, as technology drives VLSI toward higher packing densities, the high power consumption of n-MOS can create heat problems when it is packed too densely. To continue with larger-scale integration, designers must be careful to evenly distribute the elements that require high power, which drives up both the design time and expense.

Recently, CMOS has gained momentum as a replacement for n-MOS, mainly because of its very low power consumption. Originally, CMOS was ideal for such applications as watches and portable computers. At this state of the technology, its low power consumption is also becoming useful in the design of VLSI chips. As a result, because designers do not have to worry as much about heat, they can lay out their designs more quickly.

CMOS is more expensive, however, and cannot be packed as densely as n-MOS. Nonetheless, technology has significantly narrowed the gap between n-MOS and CMOS packing densities and will continue to do so. As densities improve, implementing functions in parallel in the chip design and shorter path lengths will continue to improve CMOS performance and popularity. CMOS faces another testing hurdle, too: It may require a very low capacitance environment, something not easily achieved on a high-pin-count tester.

ECL has gained a significant market niche because of its high speed. For most high-speed applications—25 MHz and higher—ECL is the only available alternative. However, ECL has problems, too. Packing density is low because of the heat generated by the high power consumption of ECL, and it is extremely sensitive to such environmental conditions as static and noise. It is also relatively expensive and poses serious design difficulties.

These problems are being dealt with. New technologies, such as gate arrays, are reducing both the design time and the cost of ECL. In addition, computer-aided design systems are making it easier to design boards using this technology.

Cost per test

One thing that is almost unique about the semiconductor industry is the way manufacturers are attaining higher performance at a lower price. Technology has allowed manufacturers to increase the complexity of their products as they drive manufacturing prices down. Manufacturers are constantly introducing new chips that outperform everything that came before them. Then, as more and more competitors catch up and enter the market to sell these parts, prices drop still further.

As manufacturing costs go down, testing becomes a larger proportion of each part's cost, so it is quite desirable to test chips at a lower cost per part. This can be achieved in two ways: by lowering the price of the tester or by increasing its throughput.

Lowering the price isn't always easy, especially in the VLSI segment of the industry. The number of pins, speed, and accuracy requirements of semiconductors are always increasing. Five years ago, a 40-pin device operating at 10 MHz was state of the art. Now 68- and 120-pin packages are becoming common. MOS chips are routinely operating at 25 MHz, and ECL chips at 80 MHz, and there seems to be no upper limit.

Gate arrays and system modules on some chips have pushed current pin counts to beyond 200. Because of these advances, the complexity and sheer size of the tester must increase—and along with this, the price. Therefore the requirement for a lower cost per test dictates that testers must have higher throughput.

The importance of accuracy

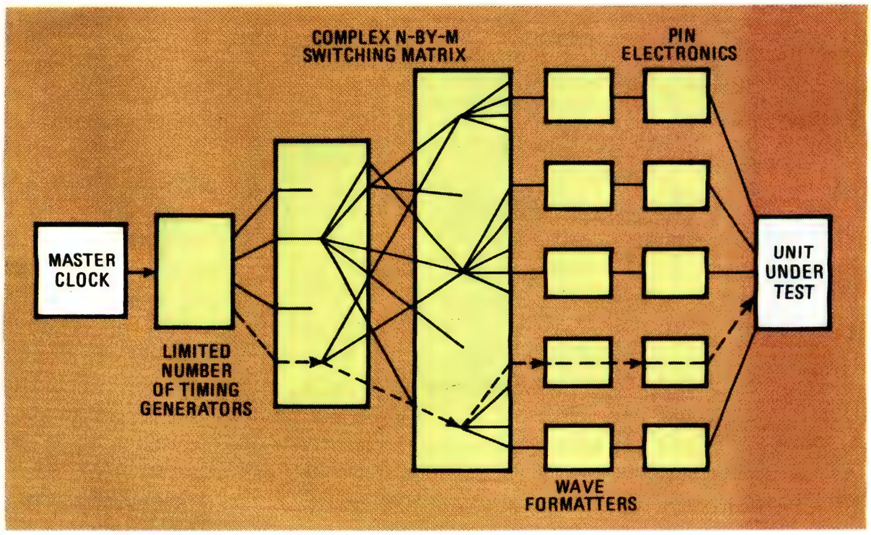
As the evolution from SSI to VLSI increases the complexity of integrated circuits, manufacturers have more time and money invested in each chip. It therefore becomes essential that only good chips be shipped and, what is more important, that only bad chips be discarded. An inaccurate test system must be "guardbanded"—that is, if a chip is near the edge of its performance specification, it must be thrown away.

When using testers with poor accuracy, test engineers cannot be sure whether it is the part that is actually out of specification or whether the tester, with degraded accuracy, has caused a chip to fail. As these marginal, but in reality good parts are thrown away, the manufacturer's costs increase, and the amount of test and manufacturing capacity required to meet schedules is inflated artificially.

At the present time, the typical accuracies of VLSI testers are in the range of 2 to 5 ns. However, certain specifications of some selected VLSI chips can be as low as 20 ns. One example would be the time it takes for a chip to respond with data after being addressed (access time). If the assumption is made that the tester has a 2-ns accuracy, this indicates that a 10% guardband would have to be used for this particular specification, in order to be sure that all parts that are accepted would in fact be within specifications. Any part that exhibits an access time of less than 18 ns would have to be rejected.

Improved tester accuracy can therefore have great economic impact. Improving accuracy to better than 1 ns can easily save an additional 5% of good chips. This in turn can improve a manufacturer's revenues significantly.

When a test engineer has a 256-pin microprocessor


COMPLEX N-BY-M SWITCHING MATRIX
PIN ELECTRONICS
MASTER CLOCK
UNIT UNDER TEST
LIMITED NUMBER OF TIMING GENERATORS
WAVE FORMATTERS

3. Shared resources. The traditional shared-resources architecture of semiconductor test equipment distributes a small number of central timing resources through a large switching matrix to the appropriate groups of pins on the unit under test.

with more than half a million test vectors, tester-software capabilities become a very important part of the system operation. Moreover, given the many applications and technologies now available—linear or digital, ECL or CMOS, LSI or SSI, memory or logic, just to name a few—a test engineer might have to make use of several different testers over the course of a year. An attempt should therefore be made to have the tester-software environment and test language be as standard and high-level as possible, in order to make it easy to move from one system to the next.

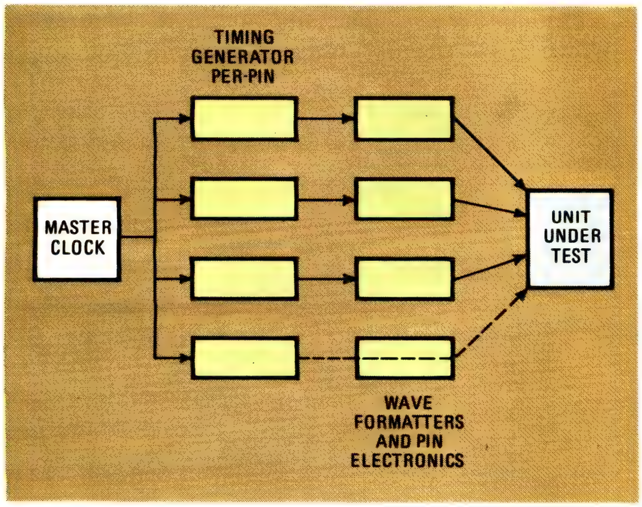
If possible, programs already written on other testers already in use, or developed on simulators or CAD systems, should be able to be easily implemented on any tester already on the floor. If this is not possible, the test engineer has a choice of either keeping the old tester active or going through the long task of writing and debugging a new program.

Productivity is critical

Perhaps the most critical requirement for easy programmability is engineering productivity. Test engineers are already scarce and the demand for those with experience is constantly increasing so that a good engineer's talents must be utilized to the fullest extent. In the past, programs for many complex ICs have taken months or even man-years to write. Both overhead and development time must be lowered to weeks or days, since, of course, productivity translates directly into savings for the manufacturer.

Reduced time for program development is also very important for meeting the needs of the growing market for application-specific integrated circuits. Since the manufacturers of these ICs are developing a large number of different chips, each one in relatively low volumes, long and expensive program development raises the cost of each one disproportionately. Even worse, the time that it takes to complete the program development process can seriously delay the shipment of these chips to customers.

As computers become more deeply integrated into every phase of the engineering and manufacturing process, the resources developed in one area of the factory should ideally be used to promote the smooth operation of processes in other areas. In order to be better able to keep track of manufacturing difficulties, and to forestall or correct engineering design problems, as test results are obtained they can be supplied both to management and to engineering. Improved communications between computers on the test floor and those in other parts of the factory can aid data transfer and company communications. Sophisticated data-management tools can track yield and productivity to ensure that quality and volume goals are being met.



4. Tester per pin. Connecting testing resources, on a one-to-one basis, to the appropriate pins on the unit under test permits greater performance from the available hardware, greater flexibility of the software, and improved overall test system throughput.

MOS technology is and will continue to be the dominant one in the semiconductor industry for several years. Of course, growth still continues in the other technologies, such as ECL and bipolar. Since large merchant manufacturers typically deal in all three technologies, and because they each have different test requirements, testing all of these types of chips on one machine is now virtually impossible. Therefore, along with the technology mix comes an increasing mix of functions required of the tester. In chip manufacture, instead of dedicating each of several chips to different functions, the trend is to combine diverse functions on one chip. This tendency drives up complexity and pin counts, of course. It is already common, for example, to see memory functions integrated in the design of large microprocessors. Embedded memory, though now part of the processor, is still required to be tested with techniques used primarily on memory testers. Also, many of the new so-called "smart" memory chips require functions that are not available on typical memory test systems.

Level-sensitive scan design is a test technique now being designed into some larger, more sophisticated testers to permit them to access nodes deep within complex VLSI chips. The level-sensitive scan designs string together a chain of 1s and 0s and walk it through the entire chip, thereby allowing access to all nodes.

This method imposes new demands on VLSI testers by requiring long vector sequences (in the millions), which is not supported by a majority of testers now on the market. Large numbers of these nodes cannot be tested adequately by conventional methods, because, on a large chip, they are many layers from an input pin.

Implementing a solution

In 1980, Megatest decided to design a test system that could address the requirements of VLSI devices. In late 1983, they introduced a 256-pin, 40-to-80-MHz test system, based on AT&T Bell Laboratories' Unix operating system, with a "tester-per-pin" architecture. This provides all critical test resources, such as timing generators, vector memory, and wave formatters to be on every pin of the unit under test, as required. It makes test programming simple and straightforward. By using a tester with this type of architecture, manufacturers with a variety of requirements will be able to test their products quickly, accurately, and inexpensively, and can expect to be prepared for the rapid changes that have come to be anticipated in the IC marketplace. □

Scott Kline is product manager for software and networks with Megatest Corp., San Jose, Calif.

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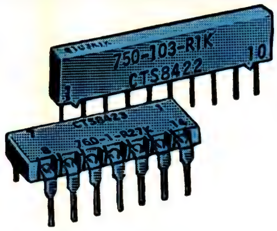

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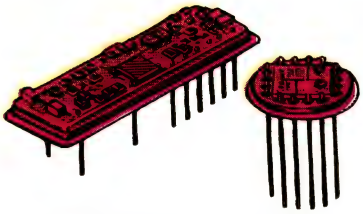

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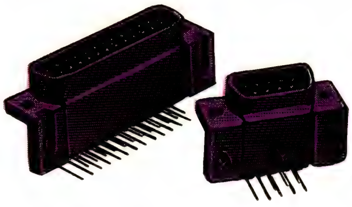

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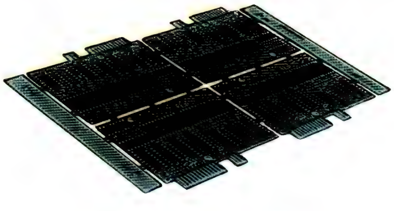

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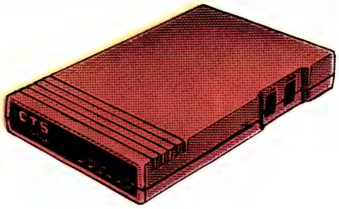

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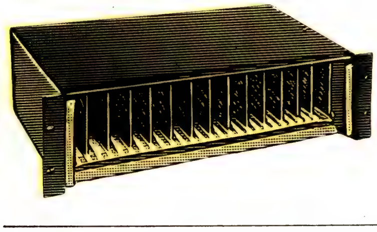

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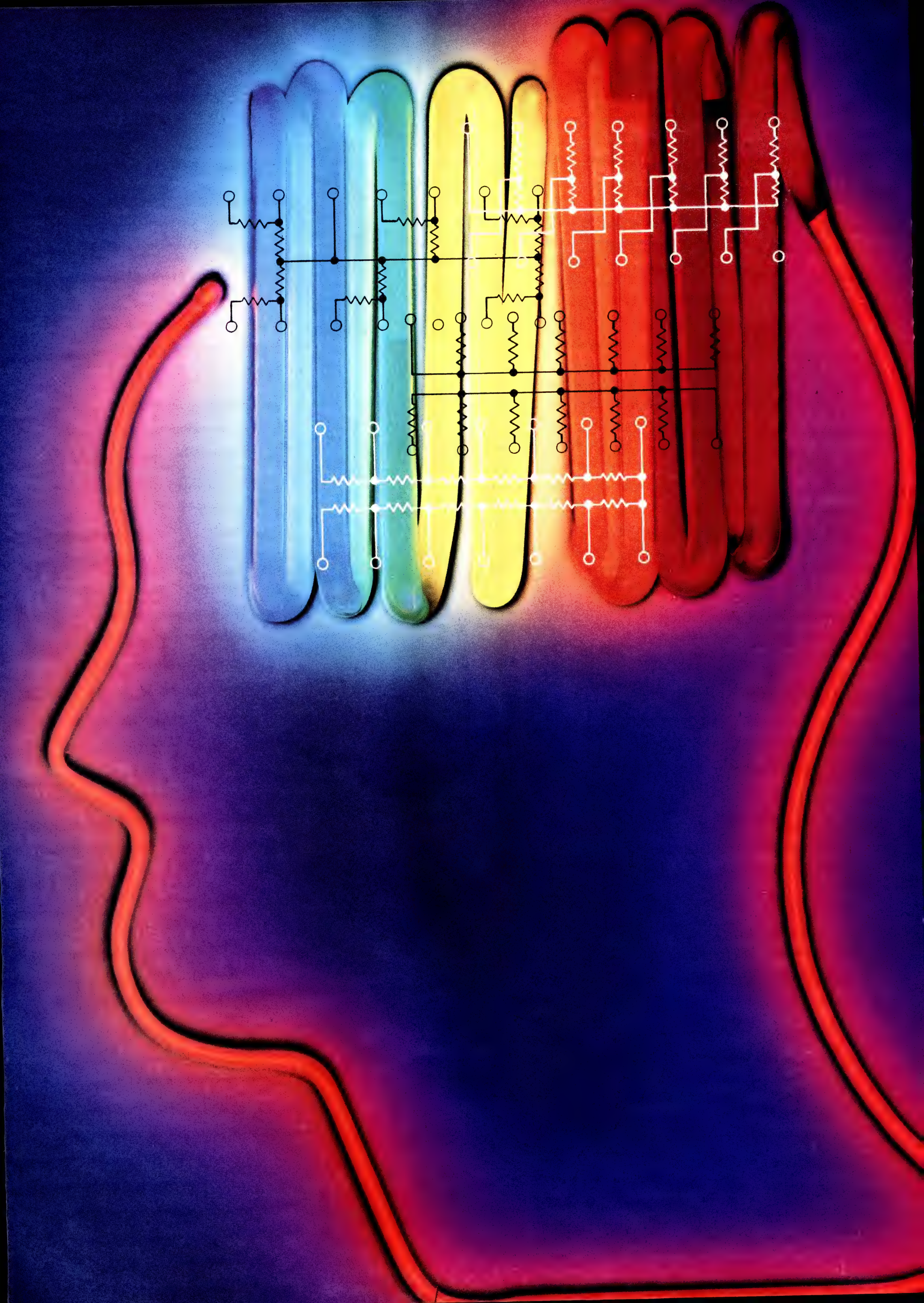

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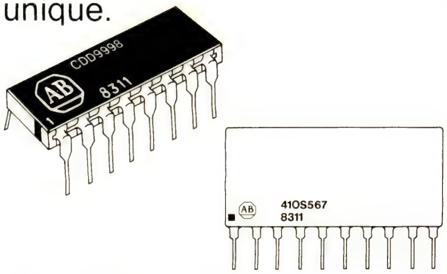

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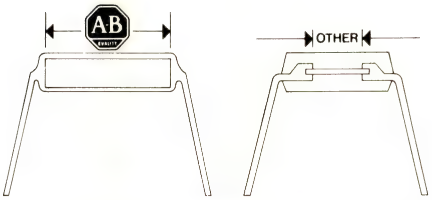

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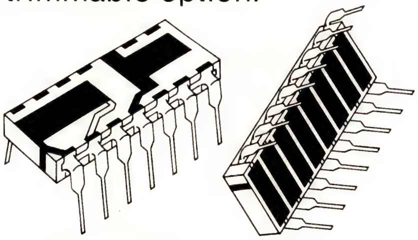

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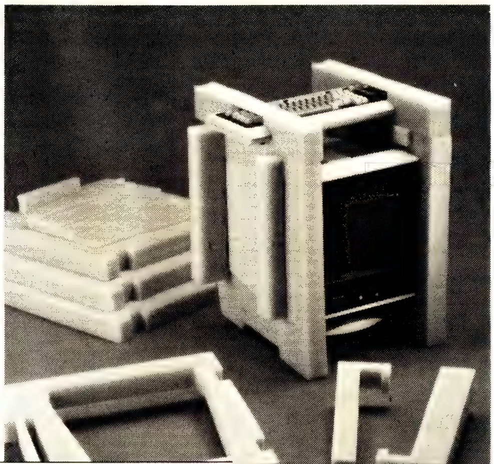
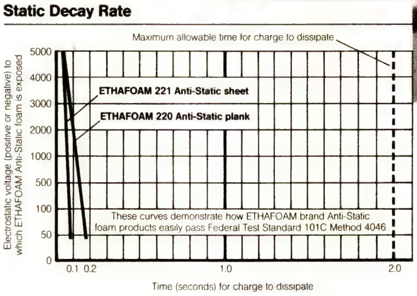
for protecting sensitive electronic products from static damage in process, in transit, and in storage.



Now you can help protect your delicate, high-value electronic products from electro-static damage with ETHAFOAM brand Anti-Static foam products.

These polyethylene foams have an internal anti-static agent which reduces static potential within the foams themselves. And they have the ability to dissipate static discharge from other sources which could damage your sensitive products. These properties remain virtually unaffected throughout normal service life of the foams. What's more, the foams meet a government standard set for anti-static materials.

Static Decay Rate



These curves demonstrate how ETHAFOAM brand Anti-Static foam products easily pass Federal Test Standard 101C Method 4046

Get anti-static protection along with traditional performance and cost benefits of ETHAFOAM.

ETHAFOAM Anti-Static polyethylene foams provide the same cushioning characteristics, protective capabilities, and cost effectiveness as our other ETHAFOAM products.

For example, the durability and resiliency of ETHAFOAM Anti-Static foams offer "dynamic cushioning" and reusability. They protect from moisture, dust, and are resistant to chemical attack and temperature extremes in many applications.

They're non-corrosive, non-flaking, and attractive. And they're consistent in quality from piece to piece.

They're cost-effective because their use can often reduce packaging material costs, along with labor, shipping, handling, and storage costs. And they often work just as well as other materials, but can cost far less.

A few ways you can take advantage of ETHAFOAM Anti-Static foams.

Cushion packaging applications—ETHAFOAM Anti-Static foams can be used to protect sensitive electronic devices from physical and electro-static damage during shipment. They can be made into corner blocks, braces, saddles, pouches, bags, envelopes, wraps, interleaving and encapsulating products.

Materials handling applications—Here ETHAFOAM Anti-Static foams provide a soft, non-abrasive cushion while protecting parts from static discharge. The foams can be made into trays or tote boxes, or they can be used as a lining inside those products. They can also be made into shunt (stuffing) boards and parts separators.

Work station accessories—In this application, these anti-static foams can be made into table and bench top covers, floor mats, seat cushions, and many other products for clean room environments.

For a free copy of our new, 12-page brochure on ETHAFOAM Anti-Static polyethylene foams, write:
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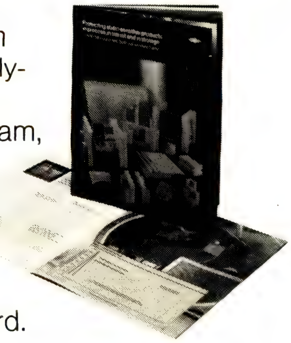

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MODULES TURN IBM PC INTO VERSATILE SCOPE

Interface and three-module set that use PC's bus in place of an IEEE-488 speed data acquisition, storage, and control

☐ *by Ann Jacobs*

Digital-oscilloscope capability has been added to the IBM Corp. Personal Computer by Modular Instruments Inc.'s M100 interface bus and three new modules: the M202 12-bit, 8-channel analog-to-digital converter; the 24-K-word M210 memory module; and the M214 data-acquisition-timer module, which has a minimum pulse rate of 65 ms with 1-μs resolution. The M100 instrument interface, introduced last year, turns a general-purpose microcomputer into a sophisticated piece of laboratory equipment.

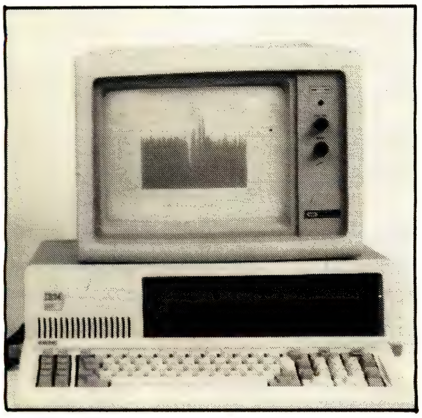
"Personal computer owners now have available to them the data acquisition and analysis features that once were available only with expensive, special-purpose instruments," points out Tom Davis, Modular Instruments' marketing manager. "The advantage over a digital oscillosope is that you have hard-disk backup."

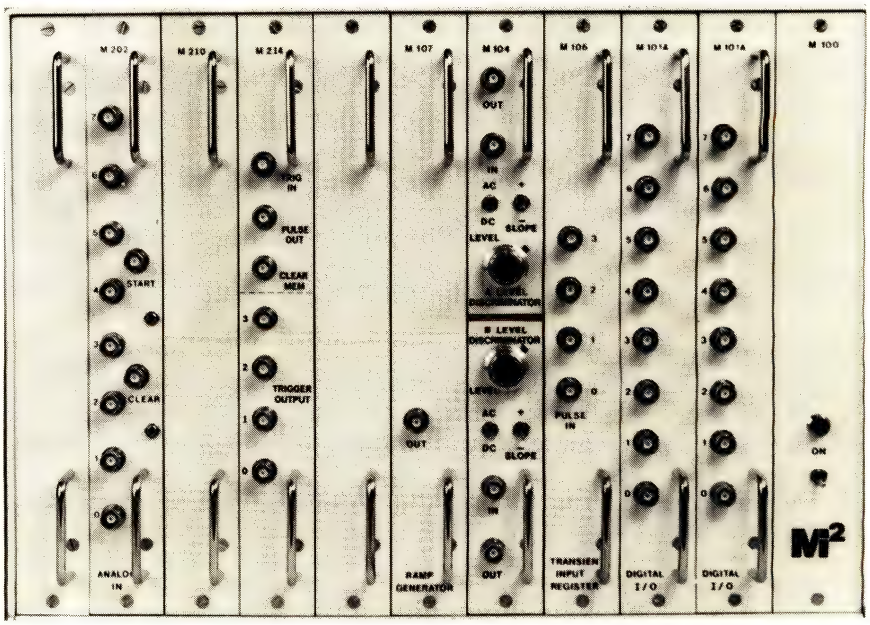
Modular Instruments' setup uses the computer's bus rather than an IEEE-488 interface. Interfaces designed around the IEEE-488 external parallel bus can't compete with the M100 in speed, nor are they as well suited to the laboratory, says Davis.

Competing computer interface buses generally target industrial-process control and data-logging applications, where ease of use, speed of operation, and flexibility are secondary concerns. The M100 also eliminates the arbitration problems of an external network.

The M100 and its modules are flexible and easy to use. Modular Instruments' digital-oscilloscope system uses standard laboratory baby-N connectors and provides all controls on the front panel. The user may plug in additional M100-series modules for other analysis tasks alongside the three oscilloscope modules. Timing and communication are performed by the host computer. The digital-oscilloscope software gives several choices for signal processing, including waveshape comparison with multiple-sweep display and waveform subtraction, automatic signal averaging of multiple sweeps, and fast Fourier transform.

Using an 8-channel multiplexer connected to a single-chip ADC through a sample-and-hold circuit, the M202 implements a 12-bit, 8-channel ADC module. The module boasts a 10-μs maximum conversion time, with rates as high as 200 kHz. It has a 50-kHz conversion rate when a software polling loop is employed. The M202 module acquires data independently in hardware, freeing





the host for fast data display and storage.

After the M210 memory module has captured the data, the host processor can transfer the data by taking control of the on-board address bus and reading the data into main memory under program control.

The M214 data-acquisition-timer module exactly synchronizes trigger-out with pulse train, which eliminates timing jitter. The stimulator output signal can be connected to an external stimulator in experiments where a synchronized stimulus is required.

The M214's hardware-generated sweep provides greater trigger stability than is possible in software-triggered systems. Cursor-controlled windowing selects portions of waveform for display, and a single keystroke redisplays the sweep region within the cursors, magnified to fill the screen display.

Existing stand-alone digital oscilloscopes generally have higher maximum digitizing rates. But they cannot give the flexibility of use and integration in a typical laboratory situation that Modular Instruments' setup provides, according to Davis. Unlike software-triggered oscilloscope interfaces, Modular Instruments' scope has the special features of completely hardware-generated sweep, including a precision analog level discriminator for triggering and synchronized hardware sweep timing.

Other modules that can be used with the M100 mainframe include a ramp generator, a pulse generator, a level discriminator, digital input/output, and an edge detector. A software library of Basic and C functions is also provided; the technical manual instructs the user in writing special-purpose programs. Special-purpose software packages are also available.

The M202, M210, and M214 are priced at $580, $480, and $350 each, respectively. The M100 mainframe, with nine slots, a power supply, and eight digital I/O lines, sells for $2,300. The oscilloscope software carries an $800 price tag.

Modular Instruments Inc., P.O. Box 447, Southeastern, Pa., 19399.
Phone (215) 337-4507 [Circle reader service number 338]

Interference analyzer tests in 20- to 50-Hz range

For ensuring that products conform with government electromagnetic-interference specifications, the EMC-11 interference analyzer spans the frequency range from 20 Hz to 50 Hz. The EMC-11 offers nine selectable bandwidths and six low-pass/high-pass filters. It also provides for both balanced and unbalanced inputs at impedances of 50, 600, 10,000, and 100,000 Ω, according to the manufacturer.

Other standard features include provision for spectrum-analyzer-type readout for use with conventional oscilloscopes and a liquid-crystal frequency display accurate to within 0.01% +1 Hz. The EMC-11 can be operated from ac, an internal rechargeable battery, or external dc power sources. With an optional built-in IEEE-488 bus adapter, all front-panel functions can be controlled remotely.

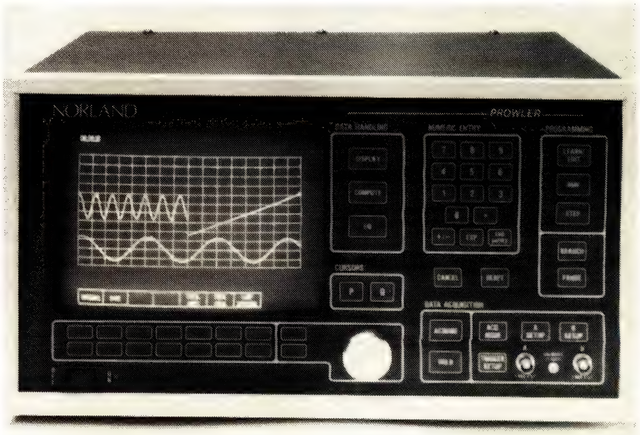
Delivery of the interference analyzer, which is priced starting at $17,950, can be made within 90 days of receipt of order.

Penril Corp., Electro-Metrics Division, 100 Church St., Amsterdam, N.Y. 12010. Phone (518) 843-2600 [Circle 342]

Digital oscilloscope takes samples at 50-MHz rates

A digitizing module for the Prowler digital oscilloscope, the 8-bit N4009, extends data-acquisition capabilities of the Prowler at sampling rates up to 50 MHz. It comes with 4,000 data points per channel as standard—but can be ordered with 16,000 data points. In addition, the Prowler can be configured with one or two channels of acquisition.

Using the Prowler's digital trigger controls, the operator can set the trigger exactly from one session to the next. Pretrigger delay captures fast transients, so the operator can designate how much of the waveform is to be captured before the trigger event.



The N4009 digitizer module sells for $2,500, and delivery takes from 60 to 90 days after receipt of order.

Norland Corp., Norland Dr., Fort Atkinson, Wis. 53538.
Phone (414) 563-8456 [Circle 341]

CMOS logic arrays put out 20 mA per output

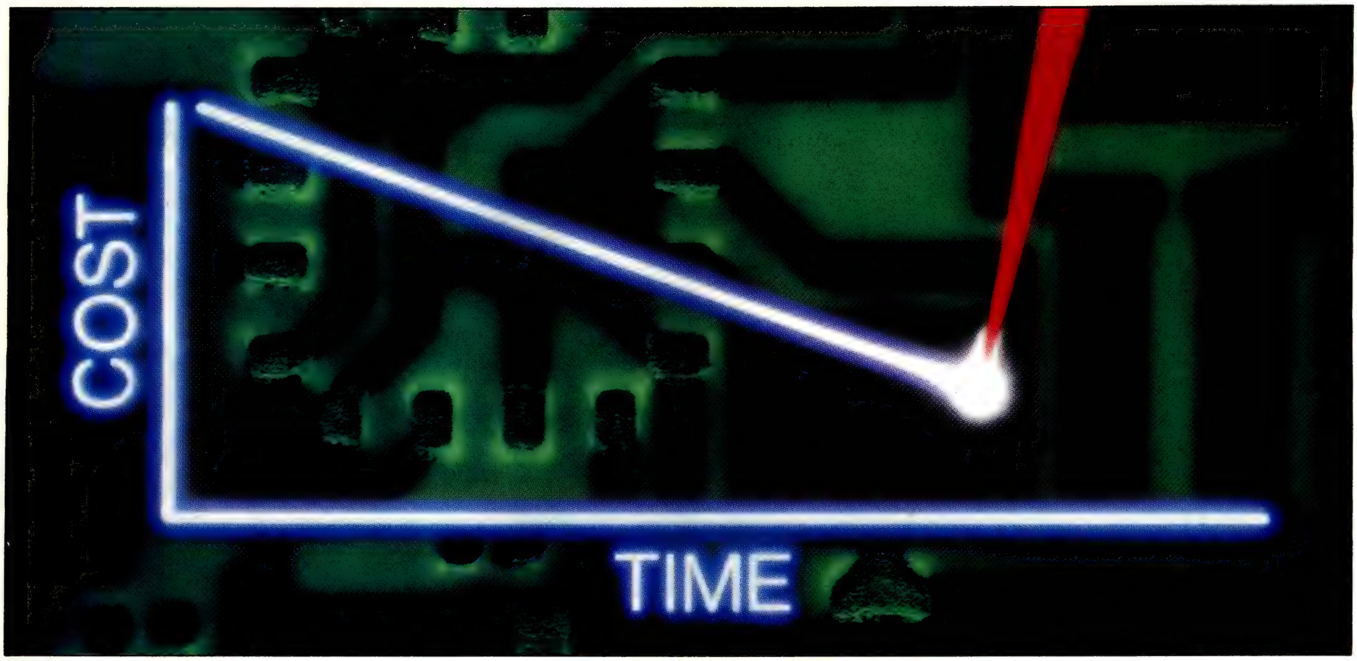
A high-density CMOS logic-array family, the LL8000 series, has the speed and output-current drive of bipolar TTL arrays and suits such specialized applications as memory and peripheral control, says the manufacturer.

The LL8000 series is a 2-μm, two-layer metal high-performance CMOS array family with 10-mA buffers reconfigurable to 20 mA per output. Gate counts range from 880 to 3,200.

The LL8000 series is supported by more than 200 LL7000 series macrocells from the same manufacturer as well as by more than 400 LL7000 series macrofunctions, with TTL speeds that are better than Schottky rates. Delay times are identical to the LL7000 series.

Typical components with 3,000 gates using 68-pin plastic chip carriers and commercial specifications sell for

Teradyne Laser Systems. Cutting cost through thick and thin.



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Our history of innovation has already given Teradyne the broadest product line in the industry.

And by sharing advanced technology among systems we have achieved another cost-cutting innovation. Absolute Accuracy.

Once calibrated, Absolute Accuracy gives you highly consistent beam positioning from system to system, increasing setup speed and reliability. Making the W419 and W421 even more cost-effective. And more reliable.

Besides expecting innovations from Teradyne, our customers expect outstanding service and support. And with over 20 technical service centers worldwide, Teradyne has more experienced people in more locations than any of our competitors.

So if you're interested in cutting your cost through thick and thin, contact your nearest Teradyne sales office . . . or mail your business card to Teradyne Laser Systems, 321 Harrison Avenue, Boston, MA 02118.

But don't delay. Missing our next innovation could be very costly.

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$55 each in quantities of 2,000 to 5,000 pieces. The LL8000 series is available now.

LSI Logic Corp., 1551 McCarthy Blvd., Milpitas, Calif. 95035. Phone (408) 263-9494 [Circle 344]

35-ns PLAs dissipate maximum of 125 mW

Nine bipolar 20-pin programmable logic arrays dissipate 125 mW, typical, according to the manufacturer, and require a maximum supply current of 45 mA. The maximum access time of the PLAs is 35 ns over the commercial temperature range.

The family is fabricated using the Schottky process, using titanium-tungsten fuses. Their stated applications are for new low-power designs and existing systems that use 35-ns standard power sockets.

Available now in plastic to fit commercial specifications, the PLA chips sell for $3.75 each in hundreds.

National Semiconductor Corp., 2900 Semiconductor Dr., Santa Clara, Calif. 95051. Phone (408) 721-5000 [Circle 343]

Quality-control vision system is easy to program

With a microcomputer-based vision system, users can develop their own inspection routines in one to three hours without the intervention of professional programmers, the manufacturer says. PDQ performs real-time measurement, presence detection, pattern recognition, and other quality-control procedures.

The PDQ (for Programs Developed Quickly) is a Z80-based microcomputer with 64-K bytes of main memory, a half-height disk drive with 368-K-byte capacity that stores 30 to 40 typical inspection programs, and a 12-in.-screen data terminal, required with initial installation. Also standard are controllers, a 9-in. video monitor, and up to two video cameras. Options include a second disk drive and a strip printer.

Average per-product inspection times range up to 200 ms, according to the complexity of the program. The PDQ system is available installed in an electronic enclosure or as rack-mountable, stand-alone equipment. It operates on 117 V, 60 Hz; 230-V, 50-Hz systems are available on special order.

A single PDQ system sells for $26,500 to $35,000, depending on options. Delivery is in six to eight weeks from receipt of order.

Key Image Systems Inc., 20100 Plummer St., Chatsworth, Calif. 91311. Phone (818) 993-1911 [Circle 346]

Lightweight TV camera can be worn by operator, robot

A 2.3-oz TV camera that takes up 3 in.^{3} of space targets applications in medicine, aerospace, robotics, industrial inspection, and any other environment where size and weight in a remote sensor are critical.

It requires 3 W of power. A 6-ft cable runs to the power supply, which can be an ac line or a 12-V battery. The electronics module's output can drive a 50-ft video coaxial cable to a remote video monitor or recorder, according to the manufacturer. Originally developed for use on a pilot's helmet in an aircraft simulator, the camera head is encapsulated in a shock-absorbing material to give it extra ruggedness.

A single unit is priced at $4,100. Delivery is in 60 days after receipt of order.

Applied Science Laboratories, a division of Applied Science Group Inc., 335 Bear Hill Rd., Waltham, Mass. 02154. Phone (617) 890-5100 [Circle 345]

System lets Professional 350 mimic PDP/11s under RT-11

Users of the Digital Equipment Corp. Professional 350 are being offered the Pro/TSX-Plus operating system, which transforms the computer into a low-cost, three-user PDP/11-compatible machine. Access is given to the entire range of applications and utilities under RT-11, DEC's most popular operating system.

The Pro/TSX-Plus operating system provides 64-K bytes of virtual address space for each task, permitting all RT-11 applications to be run. Data and directory caching improve file input/output speed, and the manufacturer states that the facility reduces compilation time

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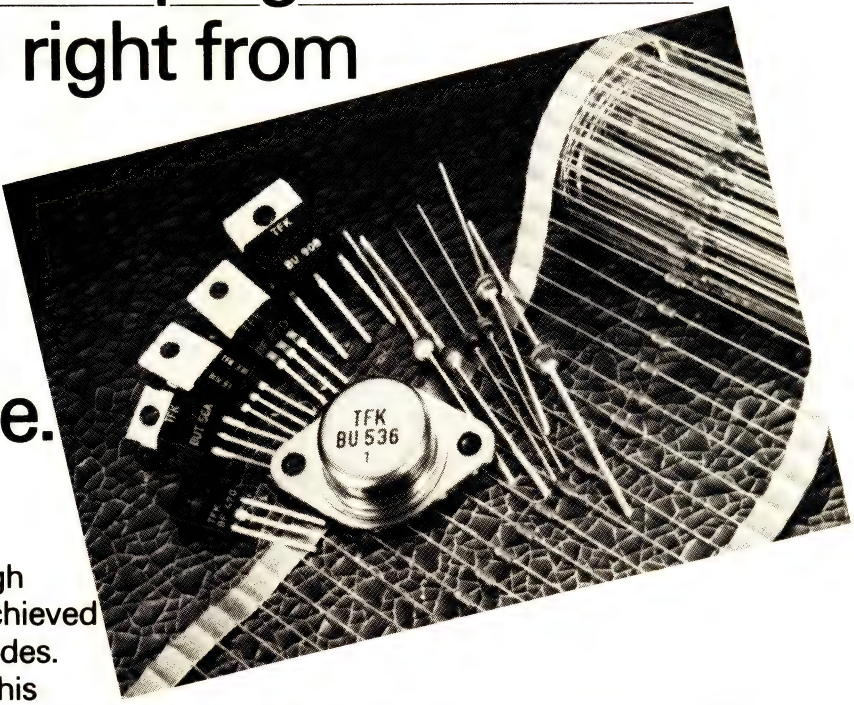

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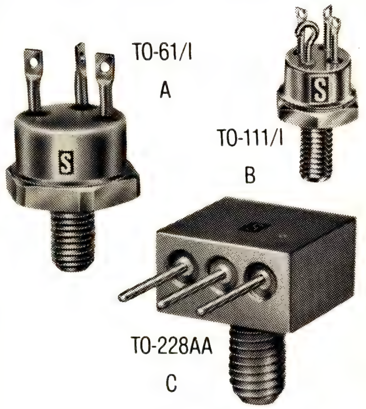

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on DEC's Fortran and its own Cobol-Plus by 20% to 40%. Additional features include spooled printing, record locking, concurrent program control, and a virtual debugger.

Available now, with quantity discounts offered, the Pro/TSX-Plus sells for $900 for a single system.

S&H Computer Systems, 1027 Seventh Ave. S., Nashville, Tenn. 37212.
Phone (615) 327-3670 [Circle 347]

Compiler lets IBM PC users write Unix-based software

Using the Lattice C compiler with Unetix, a Unix-compatible operating system for IBM Corp.'s Personal Computer, software developers will now be able to write programs for both the PC-DOS and Unix markets on their Personal Computers, without having to change compilers.

With the multitasking Unetix operating system, users can simultaneously run and display several applications software packages, whether based on PC-DOS or Unix.

Cross-versions of the Lattice C compiler will also be distributed, to run under a variety of Unix-based minicomputers and under the VMS system on Digital Equipment Corp.'s line of VAX minicomputers.

Available now, the Unetix compiler sells for $200 per unit; volume discounts are offered.

Lantech Systems Inc., 9635 Wendell Rd., Dallas, Texas 75243.
Phone (214) 340-4932 [Circle 348]

Package links Unix users with IBM mainframes

Stepping over a barrier that formerly denied Unix systems suppliers access to IBM Corp.'s mainframe computers over IBM's Systems Network Architecture, Access/SNA 3270 increases opportunities for applications of Unix in the business world.

Because Access/SNA is written in C, the Unix version can be used with a wide range of operating systems. Special features include the ability to connect any ASCII terminal to an SNA network, to simultaneously support different types of printers, and to perform the functions of 3270 cluster controllers.

With the Unix version of Access/SNA, single- and multiuser Unix systems can emulate IBM products including the 3274/3276, 8100, and 3770 systems. The software can also coexist with other Unix products.

Complete documentation, written to match the standard format of Unix programmer manuals, is included as well as details on how to configure, access, and maintain Access/SNA in a Unix environment. Initial licensing fees for Access/SNA range from $75,000 to $100,000. The product is available now.

Communications Solutions Inc., 992 S. Saratoga-Sunnyvale Rd., San Jose, Calif. 95129. Phone (408) 725-1568 [Circle 349]

Membrane keypad is backlit with little added thickness

Electroluminescent backlit membrane keyboards offer full, even illumination with minimal thickness and can be designed for the selective lighting of individual switches, groups of switches, or border illumination. The manufacturer is promoting the backlit keyboard as an alternative to the pinpoint light provided by a light-emitting diode or incandescent display.

The screen-printed panels are said to perform best with a dc-to-ac driver, but they can also be run on line current.

Tactile and nontactile configurations are available, as well as environmental sealability and shielding against electromagnetic and radio-frequency interference. Dead fronting of the graphic overlay is another option that is offered by to the manufacturer.

Pricing and delivery information were unavailable at press time.

Dorman Bogdanoff Corporate Center, Willow Pond, Andover, Mass. 01810.
Phone (617) 470-0001 [Circle 356]

Low-profile keyboard meets DIN ergonomic requirements

An off-the-shelf keyboard, the DIN-123, meets standard ergonomic requirements for keyboards as established by the Deutsches Institut für Normung. The DIN-123 is con-

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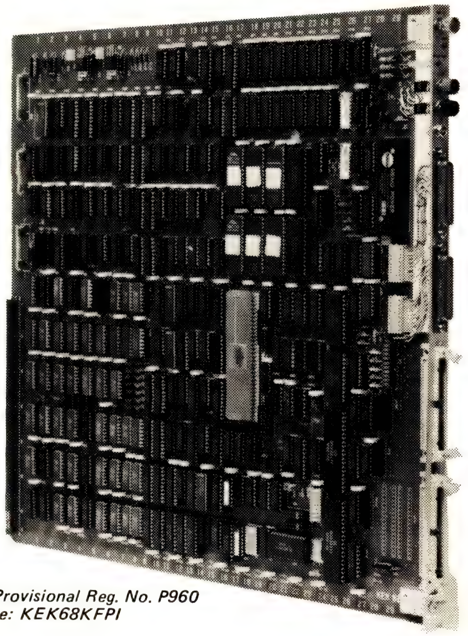

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Product Name: KEK68KFPI

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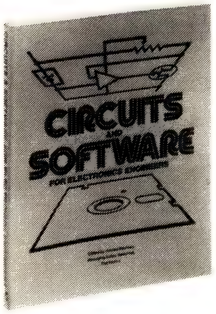

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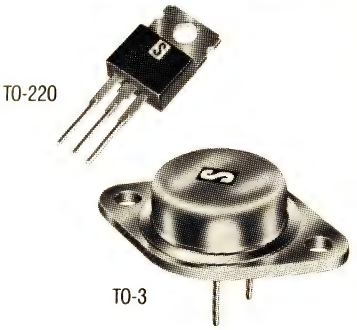

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trolled by an on-board microprocessor and interfaces with IBM Corp.'s Personal Computer and with RS-232-C, RS-422, and RS-423 devices.

For extended software implementation, 21 reassignable function keys occupy the keyboard's top row. Pricing was unavailable at press time.

Amkey Inc., 220 Ballardvale St., Wilmington, Mass. 01887.
Phone (617) 658-7800 [Circle 357]

Unix-based mainframes reach midsized business markets

Three mainframe systems, the largest with 12 megabytes of main memory, and related software run under a Unix-based system. The system targets distributed data-processing environments in medium-sized businesses as well as in university and government settings.

The A3 computer series can be configured with from 3 megabytes to 12 megabytes of main memory, 8 to 24 data-communication lines, and up to 1.5 gigabytes of disk storage at the high end.

The XE 550 system is supported by its own software based on the Centix operating system, an enhanced version of Unix V. The XE 550 cluster processor supports up to 16 PT 1500 intelligent terminals at speeds as high as 307 kb/s. The XE 550 is modular and can be adapted to various workloads.

Configured prices of the A3 mainframe series range from $136,000 to $450,000. Configured prices of the XE 550 system are from $43,300 to $102,855. Shipments of the A3 model D will begin in November, with other models to follow.

Burroughs Corp., 1 Burroughs Pl., Detroit, Mich. 48232.
Phone (313) 972-8818 [Circle 355]

Desktop computer holds 12 32032-based processor cards

Up to 12 processor cards may be stuffed into the Expert 32, a multiprocessor computer. The processor cards, the series E82/CPU2, are built around the 32032 32-bit microprocessor. Each E82/CPU2 offers 32-K bytes of cache memory, a floating point processor, a memory management unit, and a clock-calendar that works in real time.

The system has a 16-slot, double-width VMEbus backplane. A standard machine comes with a processor board set, 512-K bytes of main memory expandable to 16 megabytes, a peripheral interface card with a direct-memory-access Small Computer Systems Interface for disk drives, and four RS-232 serial channels, expandable to 20. A Centronics-compatible parallel printer interface is provided, as is a 500-W power supply and hard-disk drives with 10-megabytes of removable and 10-megabytes of fixed storage.

The Expert 32 will support Unix by the end of the first quarter of 1985. Compilers for Fortran, Pascal, C, and Modula 2 languages are available.

Single-quantity prices for the system start at $17,700. Additional processor sets (E82/CPU2) and 2-megabyte random-access memory cards (E82/RAM2) are also available for $3,850 and $5,625 each, respectively. The system will be available by the end of November.

Elite Computer Systems, 4129 May St., Wichita, Kans. 67209.
Phone (316) 942-6619 [Circle 354]

Precision 12-bit ADC guarantees few errors

No missing codes over the full temperature range and a total unadjusted error of ±1 least significant bit are claimed by the manufacturer for the AD7582, a monolithic 12-bit CMOS analog-to-digital converter. Maximum conversion time is 100 μs.

The converter requires a +5-V external voltage reference and several passive components. An auto-zero comparator ensures low zero and gain errors, making external and calibration trims unnecessary.

The four high-impedance analog inputs can be driven from source impedances of up to 2 kΩ, eliminating the need for fast-settling buffer amplifiers. The converter can accept analog signals of 0 to 5 V.

The AD7582 is microprocessor-compatible and has a byte-selectable interface to an 8-bit bus.

Housed in a 28-pin dual in-line

package, the AD7582 comes in three temperature ranges and in both ceramic and plastic packages. The plastic KN, specified from 0°C to 70°C, is priced at $32.50. Availability in all grades is from stock.

Analog Devices, Rte. 1, Industrial Park, P.O. Box 280, Norwood, Mass. 02062. Phone (617) 329-4700 [Circle 359]

Synthesizer with 1,500 words is suitable for industrial use

A solid-state programmable speech synthesizer designed for industrial use, the Voicalert has a 1,500-word vocabulary that can be manipulated to produce up to 12 phrases. It features message repeat and volume control and, the manufacturer says, speaks clearly and with an appropriate sense of urgency so that the listener will know how to respond.

The Voicalert sells for approximately $300, and quantity discounts are available. Delivery will be made in two to four weeks.

Voicalert Mktg., Engineered Systems Inc., 2001 W. Campus Dr., Tempe, Ariz. 85282. Phone (602) 438-1362 [Circle 350]

Peripheral uses RS-232-C to let computers talk

The Calltext 5050 is a voice peripheral that gives computers with an RS-232-C port the ability to speak using an extensive English vocabulary. It includes an updated version of the text-to-speech conversion algorithm used in earlier versions and a full-function telephone interface in a stand-alone package measuring 5.5 by 9 by 16 in.

Suited for uses in interactive systems with either local or remote users, the Calltext 5050 provides voice prompts, warnings, and responses. A push-button phone can be used to interact directly with any computer equipped with the peripheral.

The telephone interface in the Calltext 5050 will both detect and generate dual-tone multifrequency signals and provide the controls necessary to answer and intiate calls. It connects to the telephone network through a standard RJ-11 modular connector.

Available now, the Calltext 5050

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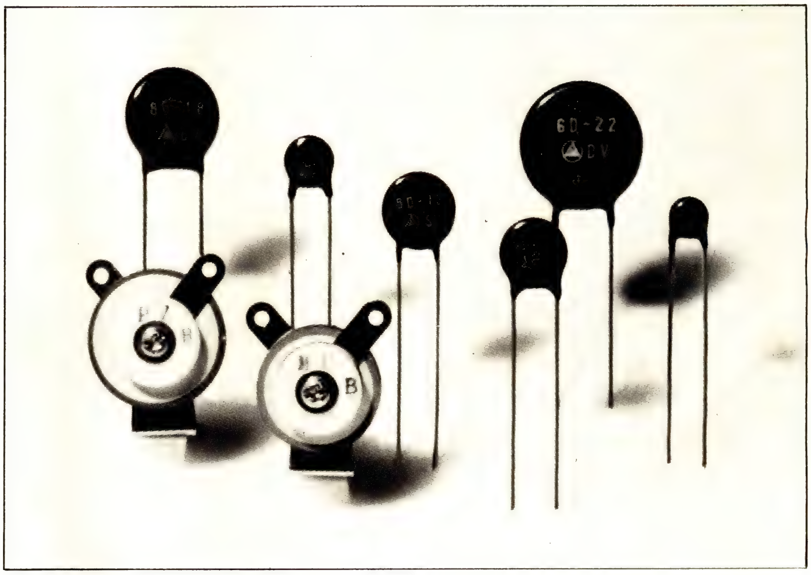

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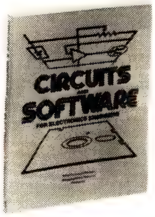

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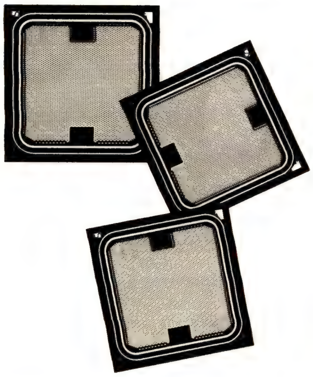

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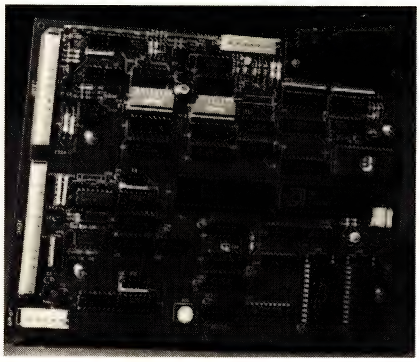
supports up to three simultaneous conversations. Equipped to handle a single conversation, the unit costs $2,975 in single quantities. It can be upgraded to handle additional simultaneous conversations by installing CT5010 expansion cards priced at $2,700 each.

Speech Plus Inc., 461 N. Bernardo Ave., Mountain View, Calif. 94043.
Phone (415) 964-7023. [Circle 351]

Motion-control card fits new or existing machines, robots

Driving eight axes with programmable position, velocity, acceleration, and gain, a programmable motion-control card can be integrated into new or already installed robots and other machinery. Each card fits an industry-standard servo amplifier chassis slot and runs under the control of a personal computer in Basic language.



A 400-step motion buffer is located on the card. Operation at 200,000 encoder counts/s, with linear and circular interpolation, is possible. Hydraulic or dc servos are controlled with or without tachometer loop.

In small quantities, the card sells for less than $700.

Delta Tau Data Systems Inc., 21115 Osborne St., Canoga Park, Calif. 91304.
Phone (213) 998-2095 [Circle 353]

Robot dispenses liquid quickly, without clogging

A liquid-dispensing system that uses a virtually nonclogging valve is said by the manufacturer to perform automatic solder masking and preconformal coating masking for printed-circuit boards up to 35 times faster than other processes, at speeds up to 55 in./s. Typically, 12 panels, each requiring eight masked pads and one masked strip 2 in. long, can be solder-masked in 50 s.

The ECLD 311, a robotic system, also controls very low flow rates with no clogging. The adjustable flow rate permits the creation of a variety of patterns over an area up to 20 by 22 in. The robot's end effector rotates the dispensing tip 90°, so that maskant can be dispensed on the sides of pins and components. Dispensing time is programmable to a resolution within 0.001 s.

The end effector of the ECLD 311 is controlled by a Seiko RT-3000 dc servo robot. An RS-232-C port allows interfacing to a host and provides off-line programming. Additional input/output ports are also present for multiple work-cell applications.

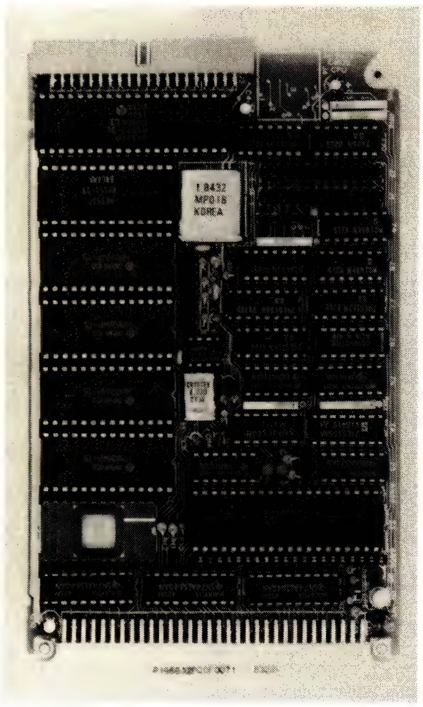
Board tooling is available from the manufacturer. The ECLD 311 includes the robot, the end effector, and software mounted in a steel base. The system is priced from $40,000 to $45,000, with delivery in six weeks.

Chad Industries, 1060-K N. Batavia St., Orange, Calif. 92667.
Phone (714) 997-4350 [Circle 352]

Eurocard-sized module has 34-K bytes of RAM

A Eurocard-sized single-board computer, the DSBC 09 is built around a 6809 microprocessor with 34-K bytes of CMOS memory. The module has an RS-232-C serial port for use with a terminal or modem, with programmable baud rates from 50 to 19,200 bits per second. It also includes two 8-bit parallel ports.

On-board memory includes 2-K bytes of memory for bootstrap operations, plus sockets to accommodate



up to 32-K bytes of random-access memory or programmable read-only memory, with battery-backed circuitry to support CMOS processors.

Built on the RM 65 bus, the DSBC module operates with 6809 or 6502 microprocessors or with CMOS 65C02, 65C102, or 65C112 processors. Two sockets are provided, one for the 6809 and one for the 6500 parts. When a CMOS part is used with CMOS memory circuits, the entire board can be battery operated.

The 100-by-160-mm module comes with a 64-pin connector as standard. The module can also be expanded with RM 65 modules such as digital and analog input/output and peripheral controllers.

Available now, the DSBC 09, minus memory, sells for $275 each in 25-piece quantities.

Dynatem Inc., 22600-D Lambert St., Suite 1007, El Toro, Calif. 92630.
Phone (714) 855-3235 [Circle 366]

LSI-11 memory card has 30-ns access time

A **memory board** for the Digital Equipment Corp. Q-bus, the MM11, is compatible with LSI-11/23, 11/73, and MicroVAX I processors. The dual-width module has a typical access time of 30 ns in the block-trans-

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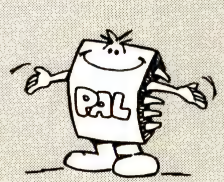

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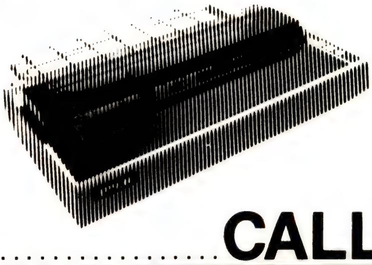

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fer mode. It is also compatible with both 256-K and 64-K dynamic random-access memories for maximum capacities of two megabytes and 512-K bytes, respectively. It also has user-programmable jumpers for 22- or 18-bit addressing, 16- or 256-word block mode capacity, 4- or 2-K word input/output paging, standard or optional column strobe-refresh (CSR) address, column strobe-refresh disable, and parity logic disable.

Said to have low power consumption, the MM11 requires 1 A at +5 V. Available now, the single-piece price is $1,295 for 512-K-byte capacity.

Andromeda Systems Inc., 9000 Eton Ave., Canoga Park, Calif. 91304. Phone (818) 709-7600 [Circle 367]

Dual-processor computer is suitable for networks

The DPX86/ME is a single-board system that includes a dual-processor architecture with both the Intel 80286 and 80186 microprocessors, each running dedicated environments. A shared-memory feature allows input/output processing including Ethernet, RS-232-C asynchronous communications, and a choice of Centronics or a Small Computer Systems Interface. A total of up to 1 megabyte of random-access memory and 400-K bytes of read-only memory can be also be configured. Additional RAM—up to 16 megabytes—can be accessed through the Intel iLBX memory extension interface.

Using the Intel 286 makes at least three major operating systems available, including Xenix, RMX286, and PC-DOS. Networking software includes a real-time network executive and the TCP/IP Arpanet protocols.

Available in mid-November, the DPX86/ME starts at $4,000 for a basic board in quantities of 100.

Little Machines Inc., 4141 Jutland Dr., San Diego, Calif., 92117. Phone (619) 483-3606 [Circle 368]

Voice-and-data stations emulate IBM/3270 terminals

The Series 25 voice-and-data work station merges telephone features with IBM Corp. 3270 terminal system display. An internal modem allows the system to dial into various asynchronous hosts and data bases. Both the 2510 and 2520 work stations provide high-resolution, nonglare, 9-in. display; an internal modem; a speaker phone; and password security.

Each includes auto dial, a personal directory, three-party teleconferencing, user-programmable telephone keys, and auto redial. Both also support calendar functions with an audio and visual reminder system.

In addition, both models support asynchronous communications. The 2510 operates as an asynchronous display terminal with a tuckaway typewriter-style keyboard. The 2520 can be connected to a controller in order to emulate 3270 displays and handle standard asynchronous communications.

Available now, the 2510 is priced at $1,295 and the 2520 at $1,895.

Lee Data Corp., 7075 Flying Cloud Dr., Minneapolis, Minn., 55344. Phone (612) 828-0300 [Circle 370]

80-line PBX grows in 16-line increments

Targeted for small businesses, hotels, and motels, the SD-80 private branch exchange offers a range from 16 lines and 4 trunks to 80 lines and 16 trunks. Compact enough for wall mounting, the SD-80 comes with or without a console.

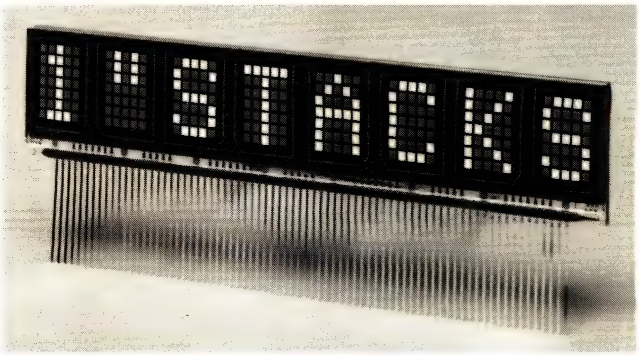
The PBX allows for growth in increments of 16 lines and four trunks and is said to offer many of the features available on larger switches. Also included are station message detail recording, toll restriction, dual-tone multifrequency operation, upgradable memory for future enhancements, and automatic on-line diagnostics. The SD-80 is convection cooled.

Available in production quantities, the SD-80 is priced according to configuration. The company says that prices are in line with systems with similar capabilities.

Siemens Communications Systems Inc., 186 Wood Ave. S., Iselin, N.J. 08830. Phone (201) 321-4842 [Circle 369]

1-by-8 display can handle upper-, lower-case characters

The SP-480-006 displays alphabetic characters in both upper and lower case, while commonly used symbols, numbers, and custom characters can be displayed easily within a dot-matrix format. It is available in a one-line-



by-eight-character configuration.

Measuring 1.725 by 8.35 in. with a depth of 0.769 in., the SP-480-006's brightness output is measured at 100 fL at 1/16 multiplexed duty cycle. Cathode current measures 4.8 mA; anode current is 150 mA at 1/16 duty cycle.

Flying leads extend 1.36 in. from the display body and may be formed into any interconnection angle required. The display refreshes in 8 ms and operates at a typical 180 V dc. Operating temperatures range from 0° to 55°C.

Beckman Industrial Corp., 2500 Harbor Blvd., Fullerton, Calif., 92634.
Phone (714) 871-4848 [Circle 372]

Intelligent module has 16-character display

The AN-16 intelligent display module is a microprocessor-based 16-character alphanumeric display. Up to 256 messages may be preprogrammed and are displayed by sending an escape sequence to the unit. The AN-16 will first clear a current display and then display a preprogrammed message.

It can also be preprogrammed to respond to a particular address. Thus up to 256 units can be connected on the same serial port and still be accessed individually. All units can be configured for broadcast messages or selected units can be enabled or disabled. An RS-232-C serial input with selectable baud rates from 300 to 9,600 b/s is standard. The module needs a single 5-V dc supply.

Larcan Corp., P.O. Box 1119, Hermitage, Pa. 16148.
Phone (412) 342-5222 [Circle 371]

Unit's ROM commands simplify plotting, drawing

The HI-80, an intelligent, four-color-pen plotter/printer for business graphics, features read-only memory commands that simplify 42 plotting and 17 drawing functions. The unit uses the manufacturer's standard print and plot ROM commands for presenting graphic data, which is generated by existing software on either paper or overhead-projector transparency film. With its variety of

VMEbus

PRODUCT ANNOUNCEMENT

SAIC is introducing a complete product line based on the VMEbus. The product line includes digital I/O, analog I/O, AC I/O, pulse rate I/O, synchro/resolver and host computer interfaces. SAIC's product line offers a complete I/O solution for the VMEbus. The digital I/O modules feature 64-bit TTL I/O, 128-bit TTL I/O, 32-bit change-of-state digital inputs, and a wide range of other I/O solutions for the VMEbus including optically coupled I/O modules and telecommunication I/O modules. SAIC's VME megamodule product line features a subset of I/O modules that support built-in-test logic, 8-,16-, and 32-bit transfers.

The SAIC analog I/O product line features an analog private bus on the P2 backplane that supports SAIC's analog-to-digital converter and low-cost multiplexer expansion modules. A subset of the analog product lines features built-in-test logic for isolating failures to the card level. The analog product line includes a 32-channel multiplexer, 64-channel multiplexer, a high-speed 40KHz ADC with on board multiplexers, a low cost ADC module with programmable gain and end of conversion interrupts. The analog product line also includes a 16-channel analog output module that features external update strobes and double buffered D/A converter.

The SAIC synchro/resolver product line supports a wide range of references and is designed with built-in-test logic to support fault isolation to the card level. The digital to synchro/resolver module is a dual-channel converter and is available with both 1.5VA and 4.5VA options.

The host computer interface product line includes a DR11W for communicating with Perkin-Elmer, Data General, DEC, Harris and Prime computers, a Gould/SEL HSD interface that supports 32-bit transfers and a VME-to-VME DMA link, that supports 8-, 16-, and 32-bit transfers.

Other SAIC VMEbus products include a VMEbus repeater for configuring large I/O subsystems without intelligence on the repeated bus. Delivery is 90 to 120 days, ARO.

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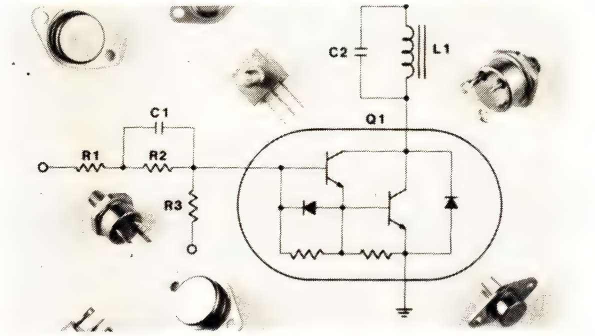

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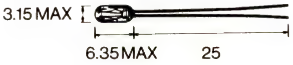

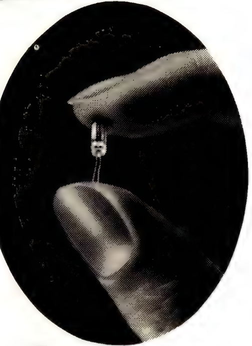

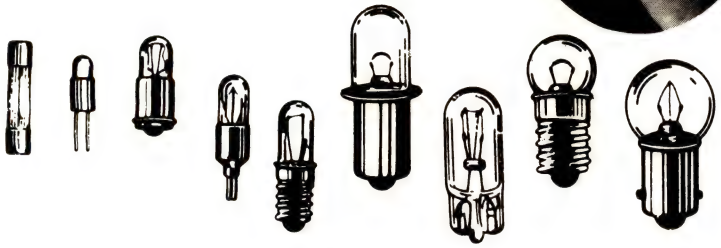

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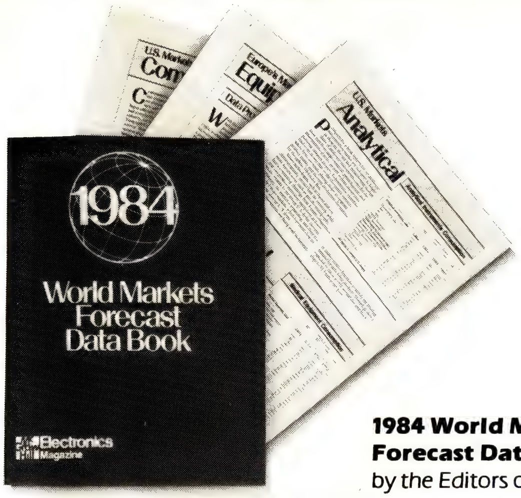

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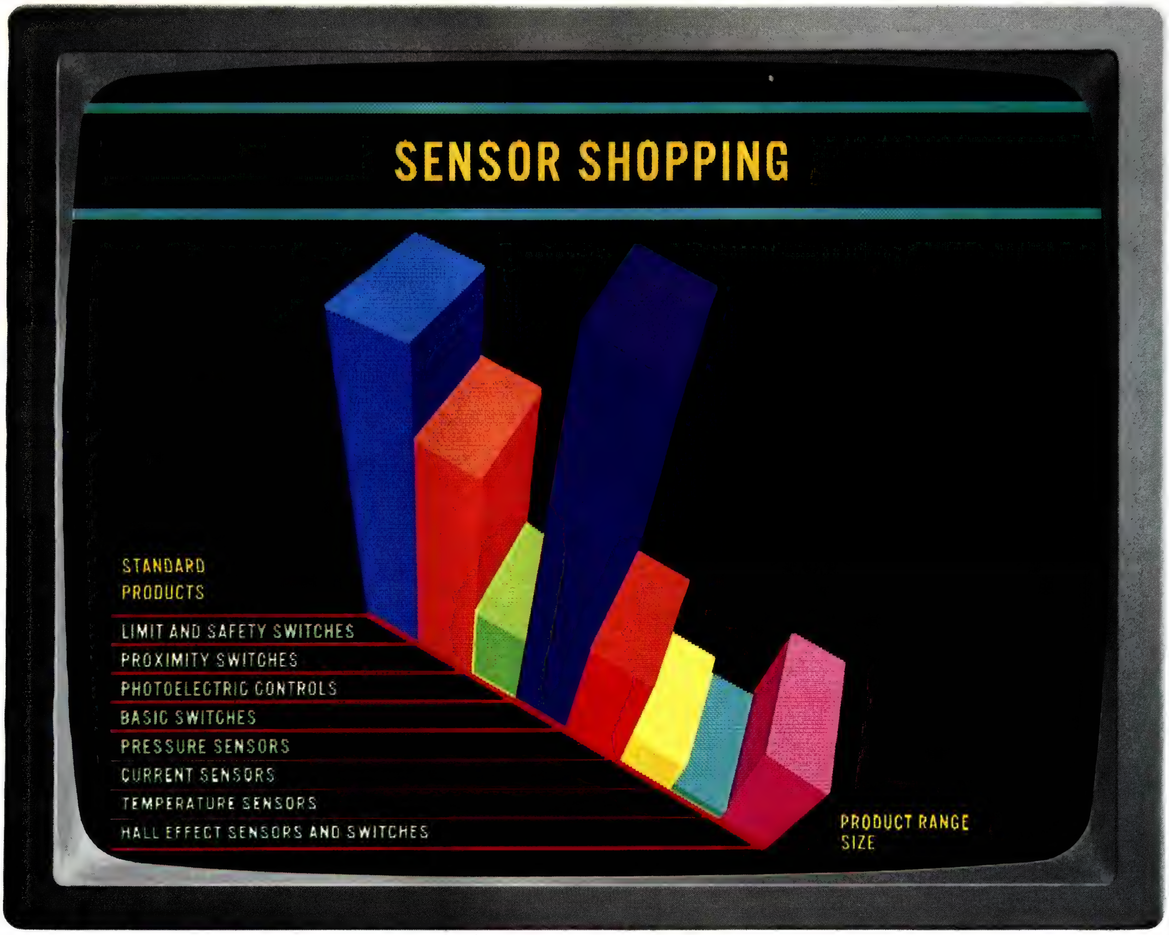

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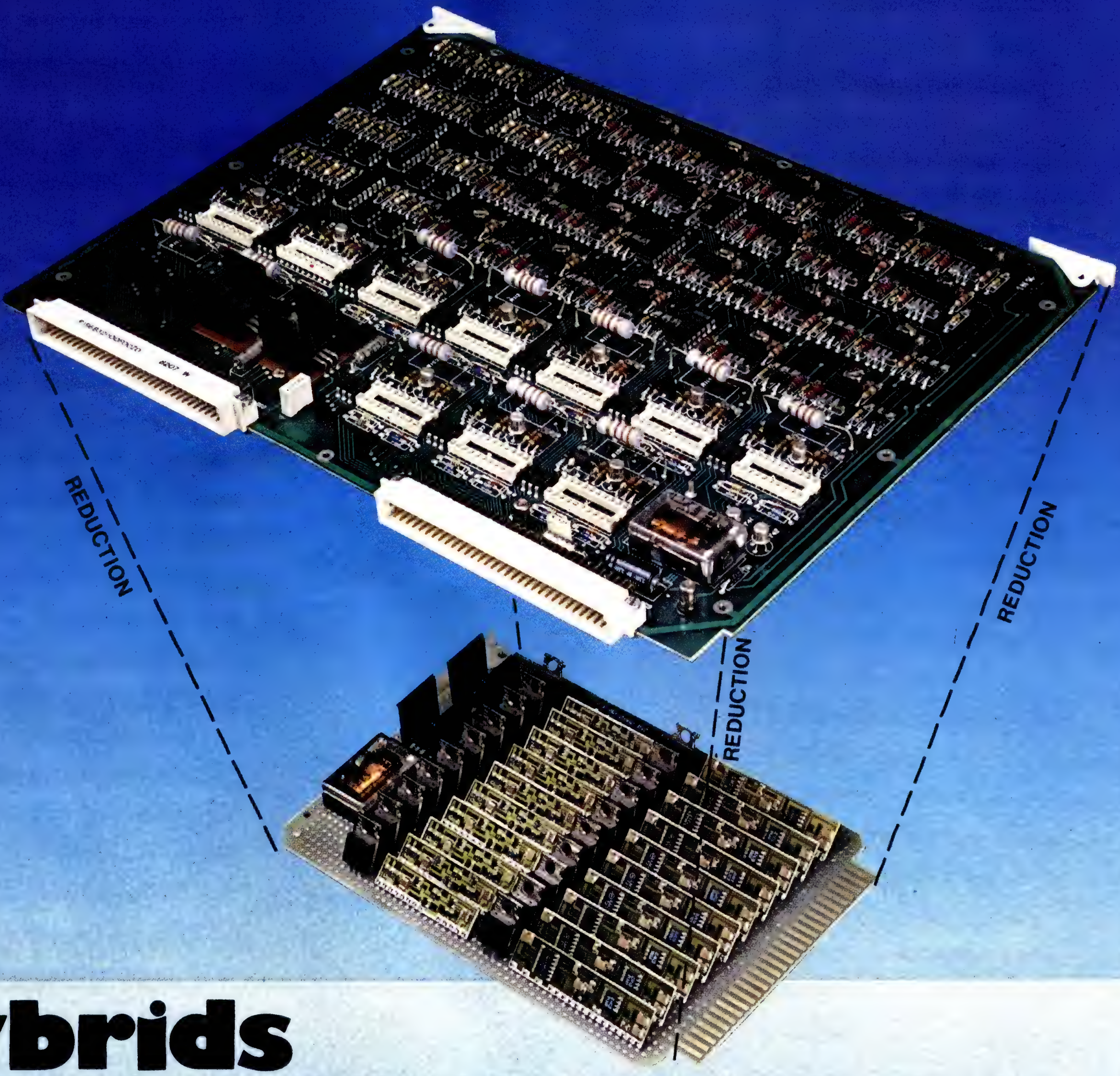

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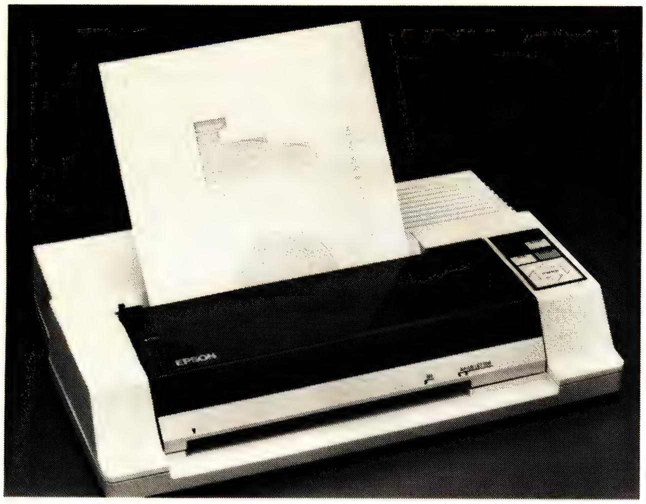


ROM commands, the HI-80 can produce multicolor images including pie charts, spirals, arcs, circles, and, in the printer mode, a variety of fonts and character sizes. The unit 80 uses a four-pen cassette containing ball-point and fiber-tip pens, and its standard colors are red, green, blue, and black.

The HI-80 has a repeatability of within 0.012 in. and a minimum step size of 0.0004 in. In the plotter mode, effective X-Y axis size is 10.5 by 7.6 in. with a maximum plotting speed of 9 in./s along either axis. In the printer mode, the HI-80 prints at 6.5 characters/s and carries a set of 96 ASCII, 32 international, and 96 graphic characters.

Available now, it is priced at about $350 in orders of 1,000 units or more.

Epson OEM Products Division, 23600 Telo Ave., Torrance, Calif. 90505. Phone (213) 534-4500 [Circle 375]

Daisy-wheel printers make only 55 dB of noise

Two models in a series of quiet daisy-wheel printers, the DP-55SQ and DP-20, print at noise levels below 55 dB. The model DP-55Q is rated at under 60 dB. Carrying a one-year warranty, all three models are virtually silent in the standby mode, because they do not require a cooling fan.

The DP-55Q and DP-55SQ have a mean-time-before-failure rating of 6,000 h; the DP-20's MTBF is 2,500 h. The model DP-55Q/SQ (pictured) can use standard plastic or metal printwheels in over 100 font styles. The DP series is available with a Centronics-compatible interface, which has self-contained word-processing firmware; this allows the unit to print in bold and with underlining, centering, and shadow printing. Accessories include a single-bin sheet feeder, dual-bin sheet feeder, and a bidirectional tractor.

Suggested retail prices for the printers are $799 for the DP-20, $2,195 for the DP-55Q, and $2,395 for the DP-55SQ.

Data Products Corp., 6200 Canoga Ave., Woodland Hills, Calif. 91365. Phone (818) 887-8000 [Circle 376]

Laser printer has 16 resident fonts

With high-resolution graphics and variable font capabilities, the LN01B and LN01S laser printers can mix various text fonts on the same page. The printers are suitable for use in computer-aided design and business graphics applications.

The LN01B features 16 resident labeling fonts and Calcomp plotter-type graphics, and supports the company's base Remote Graphic Instruction Set. The LN01S has 12 resident text fonts in four weights and supports Tektronix Inc. 4010 and 4014 graphics protocols. Both printers are supported by the company's VAX/VMS operating system, and the LN01S is supported by all PDP/11 operating systems. Available within 30 days, the LN01B sells for $22,520, the LN01S for $29,995.

Digital Equipment Corp., 129 Parker Ave., Maynard, Mass. 01754. [Circle 358]

Logic tester checks advanced Schottky TTL parts

An addition to a line of production test equipment, the model S-3225 advanced logic tester is designed to accurately test advanced Schottky TTL components. The model S-3225 is a computer-controlled system suitable for high-throughput applications such as quality control and receiving inspection, as well as engineering applications.

The S-3225 incorporates pin-driver electronics required for high-speed TTL components. Producing a 3-V transition in less than 2.5 ns, the S-3225 tests advanced Schottky TTL devices at their maximum performance levels. The S-3225 offers most of the features that are found in the S-3200 series; its 7-phase clock generator features independently programmable start and stop times with a resolution of 1 ns.

For single-shot time measurements, the model S-3225 features a single-pass ac subsystem. Working with the Time Interval Measurement Enhancement software package, the subsystem can make time measurements in the advanced Schottky range with a resolution of 50 ps. For dc parametric testing, the model 3225 provides a dc subsystem that measures voltage while forcing current, or vice versa.

Selling for approximately $300,000, the S-3225 can be delivered in the second quarter of next year.

Tektronics Inc., P.O. Box 500, Beaverton, Ore. 97077.
Phone (503) 644-0161 [Circle 377]

Emulator tests 5¼-in. and smaller hard-disk drives

A Winchester disk drive emulator is suited for 5¼-in. and sub-5¼-in. hard-disk drives operating with personal computers. It is intended for use by systems integrators and disk-drive and controller manufacturers in calibrating and verifying the read/write capabilities of their units.

The emulator, which stores one track of data, accepts and returns up to 10,416 bytes of data during a read/write operation. After a seek test, track zero's data is returned until a write operation is performed.

The emulator also includes programmable read-only memories to reconfigure track and head capacities, index timing, data-recording capacities, seek-complete timing, and power-on-to-ready timing.

The product can also be used to calibrate equipment that digitally tests Winchester disk drives and rotating memories. As a calibration tool, the emulator provides almost total repeatability of read/write functions, the company says.

Priced at $1,895 per unit, the emulator is available in 60 days after receipt of order.

Applied Circuit Technology Inc., 2931 La Jolla St., Anaheim, Calif. 92806. Phone (714) 632-9230 [Circle 378]

Graphics controller generates video rates up to 128 MHz

A high-speed version of the manufacturer's model μPD7220 graphic display controller can generate video rates up to 128 MHz and perform read/write/modify memory cycles in just 500 ns. Personal computers, color terminals, and computer-aided design and manufacturing are among the controller's applications.

Strengths of the model 7220A include an ability to address up to 4 Mb of video-display memory, programmable vertical and horizontal timing, and an internal vector generator for drawing arbitrary vectors, arcs, circles, rectangles, and characters. Other features include direct memory-access control, zoom, pan, scroll, and split screen.

The 7220 is available in 4-, 5-, and 5.5-MHz types; the 7220A, which offers easier programming and increased capability, comes in 6-, 7-, and 8-MHz versions.

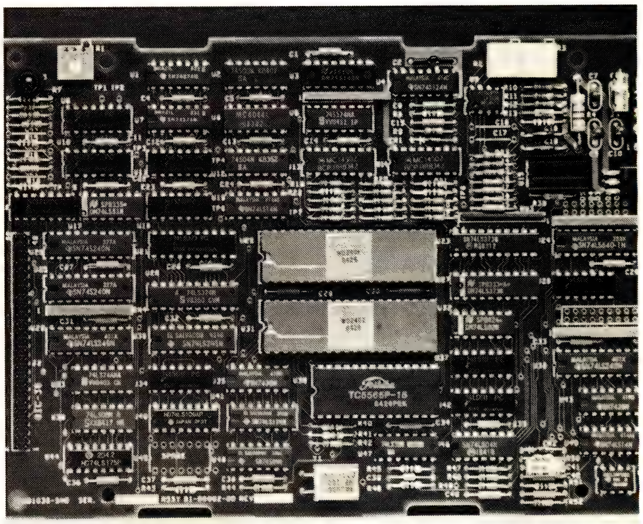
Available now, the device is priced at $130 per unit when ordered in 100-unit lots.

NEC Electronics Inc., 401 Ellis St., P.O. Box 7241, Mountain View, Calif. 94039.
Phone (415) 960-6000 [Circle 379]

Controller handles both Winchester and tape drives

Designed for supporting ¼-in. streaming cartridge tape drives, the WD1036-SHD controller links the Shugart Associates System Interface to the QIC-36 interface, reducing the overall cost of a Winchester/tape-based subsystem by over 25%, the firm says. It supports both 4- and 9-track cartridge tape drives.

The controller is a 5¼-in.-form-factor, single-board device that supports the standard QIC-24 recording format. A 16-bit error-detection code (cyclic redundancy check) and read-after-write verification algorithm ensure data integrity. A large buffer eliminates latency problems during backup.

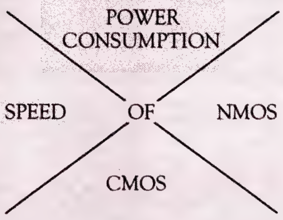


The price reduction arises from the elimination of a separate QIC-02 interface formatter board, which the WD1036-SHD replaces. The WD2400 chip set, which is optionally available on the controller board, provides tape-motion control, buffer management, and read/write formatting.

Available now, the WD1036-SHD sells for $295 in evaluation quantities; volume discounts are available.

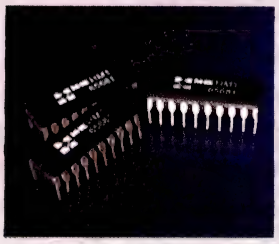
The choice of innovation thru technology

4K x 4 : a new memory concept



MHS introduces the first 16 K static memory with dynamic activation HM 65681.

The design approach is in itself an achievement, bringing together the advantages, hither to irreconcilable, of the speed of NMOS and the power consumption of CMOS in a single circuit. The new memory by MHS now makes available the performance benefits of these combined technologies.



Organized as 4096 words of a 4 bits, the design is completely new and it is the first all-pulse 16 K memory on the market.

Principle of operation:
A sense detection stage changes in level at the pins (commands and addresses) and transmits a pulse element to a controller which generates different signals of optimum width to ensure dynamic validation of the internal functions of the memory.

Result: The best compromise between speed and power consumption available on the market.

With a 10 MA/ICCOP specification, the 4 K x 4 far outclasses the competition for speed versus power consumption, over the whole range of temperatures from − 55 to 125 degree C. MHS also guarantee 55 MW consumption at 70 degree C., which gives an average well below standard products, proportional to the frequency of use.

Finally, this new memory, like all the other members of the MHS 16 K family, has a select chip controlled input structure, which gives it a low quiescent power consumption at intermediate voltage levels (VIH).

4 K x 4 format: greater design flexibility + higher speeds.

The original configuration of this new memory gives designers two important advantages:
– great flexibility in application through the reduction in package size – only 20 pins compared with 24 for the 2 K x 8 half the size but the same memory capacity.
– high speed in operation because the capacity of the input/output buses, which is normally a performance – limiting factor, is compensated by optimised output buffers. The number of buffers and bits being the same, performance goes up and size goes down.

The technical features make this memory particularly suitable for military (radar/sonar, guidance systems, aiming systems) and DP (file memory) applications.

Performance chart of the HM 65681 memory.

HM 65681	*0 °C to 70 °C*	*− 55 °C to 125 °C*
Access time	*55*/70/85*	*70*/85/100*
Operating supply current Iccop at 1 MHz	*10 mA*	*15 mA*
Standby current		
• Iccsbl at $\overline{CS}$ = Vcc–0.3 V	*50 µA*	*900 µA*
• Iccsb at $\overline{CS}$ = VIH	*3 mA*	*4 mA*
Package	*20 pin plastic, ceramic, LCC*	

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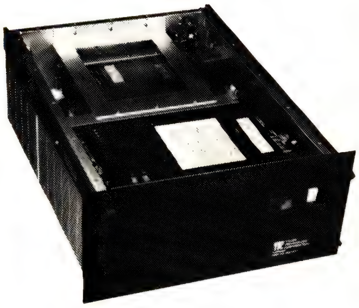

The TuffDisk data storage system, proven on land and marine seismic crews, is a cost-effective, high capacity, ruggedized disk system. Virtually maintenance free, the TuffDisk system offers these important features:

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- **Data transfer rate — 1229 kilobytes per second**
- **Shock (Operating) — 10g (11ms, 1/2 sine)**
- **Vibration (Operating) — 1g (5-500 Hz, 1/2 sine)**
- **Mean-time-between-failure — Greater than 10,000 hours.**

If you have a data storage requirement, let us explain the TuffDisk system. For a copy of our latest specification and environmental test report, telephone (214) 680-9913, or write Talon Technology Corporation, 1819 Firman Drive, Suite 137, Richardson, Texas 75081. Telex 293291-TALON. Represented in the south and southwest by Kemp Engineering Company.

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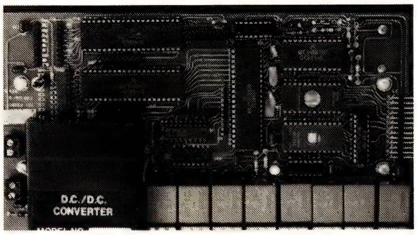
TALON TECHNOLOGY CORPORATION

CONTROLLERS □ INDUSTRIAL CONTROLS

Western Digital Corp., 2445 McCabe Way, Irvine, Calif. 92714.
Phone (714) 863-0102 [Circle 380]

CMOS computer performs industrial control tasks



A CMOS board-level computer called the C-CON is designed for industrial control applications. For control applications, the computer includes an on-board relay bank and eight 5-A, Form-C relays with terminal block connections.

The board includes a 146805 CMOS microprocessor with 112-K bytes of static random-access memory; 6-K bytes of memory with a 2-K jumper, selectable as erasable programmable read-only memory or static RAM; 48 input/output lines, including eight interrupt inputs provided by two 146823 CMOS parallel interfaces; serial multiplexed interface through a MM54240 receiver-transmitter/remote controller; and an on-board 146818 CMOS real-time clock with 50 bytes of static RAM.

The C-CON board can be powered from either an onboard 5-V, 1-A switching power supply with a range of +15 V to +30 V dc or a 5-V, 1-A switching power supply with an +8-V-to-+15-V dc input range; or the user can provide a direct input of +5 V dc.

Also included are a 26-pin male header for interfacing with fluorescent displays, 9-pin female header for 4-by-4 matrix keypads or general I/O purposes, and an 18-pin female header for interface expansion.

Valinor Electronics Inc., 1268 Pembroke St., Uniondale, N.Y. 11553.
Phone (516) 538-3247 [Circle 362]

Factory data terminal accepts variety of inputs

Designed for the implementation of shop-floor control systems, the 5740MT terminal provides IBM Corp. 3270 emulation or interactive ASCII cathode-ray-tube terminal emulation. It can connect directly with a main computer or be used with a communications processor. The terminal can also be integrated into manufacturing control systems designed to use remote CRTs.

The system simplifies data entry, allowing operators to use keyboards, magnetic-strip readers, or bar-code readers. The 5740MT can be configured for the needs of each user. Various display options guide and prompt the operator through specific operations. Terminal applications are controlled by a user-generated IBM 3270 screen format, which is downloaded to the terminal and responds to specific function keys.

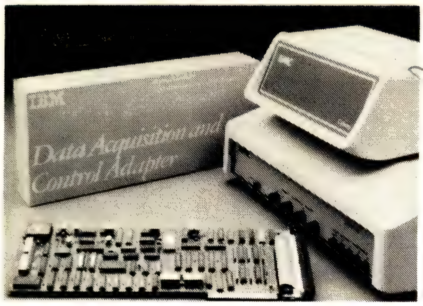
Displays available include a model with 1-line-by-32-character alphanumeric vacuum fluorescent display, a 2-line-by-40-character alphanumeric liquid-crystal display, or a 12-in. CRT with 25 lines by 80 characters.

Infolink Corp., 1925 Holste Rd., Northbrook, Ill. 60062.
Phone (312) 291-2900 [Circle 363]

Adapter suits IBM PCs to data-collection tasks

An adapter that operates with the IBM Corp. Personal Computer XT, AT, and the Portable PC lets scientists and engineers use their systems for data acquisition and control. Hardware- and software-compatible with the company's Isaac line of computer/instrument interface systems, the adapter automates analytical instruments for industrial processes, such as temperature monitoring and vibration measurements.

The adapter features four 12-bit analog input channels, two 12-bit an-



alog output channels, 16 digital inputs, 16 digital outputs, a 32-bit programmable counter, a 16-bit counter timer, and an expansion bus. Up to four adapters can be installed in the PC backplane.

The Isaac 41-X and 91-X expansion chassis provide hardware expansion capability through a connection to the IBM expansion bus. By using the expansion systems with the adapter, users gain direct signal-conditioning interface capability for thermocouples, resistance-temperature detectors, and strain gauges, and can increase the number of input channels up to 512. The firm's Labsoft package enhances the programming capability of the adapter by providing over 40 commands for real-time acquisition and control.

Available now, the adapter sells for $1,275.

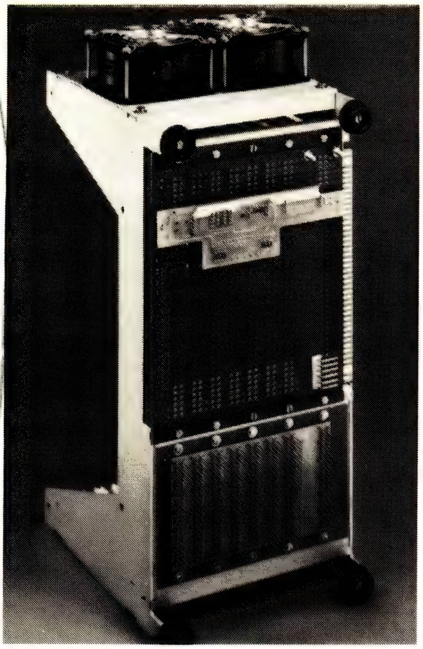
Cyborg Corp., 55 Chapel St., Newton, Mass. 02158.
Phone (617) 964-9020 [Circle 383]

Multibus backplane line has 4, 6, 8, or 9 slots

The series 500 and 600 Multibus-compatible backplane includes an optional model P2 auxiliary double-sided board that is 0.062 in. thick and has a full ground plane that provides additional shielding.

The boards are silk-screened, and two options—bused point-to-point or Intel specification 9800683-02—are available. Boards that serve four-, six-, eight-, and nine-slot backplanes are available from stock, and on request the firm will populate only those slots specified by the customer.

Pricing for the 500 series (with a P2 auxiliary board) ranges from $231 for 16 slots to $288 for 20 slots. The 600 series (which also includes a P2 board) runs from $55 for four slots to $130 for nine slots.



Hybricon Corp., 410 Great Rd., Littleton, Mass. 01460.
Phone (617) 486-3174 [Circle 384]

Pod lets ML4100B analyzer handle 68010 processors

An enhancement to the ML4100B logic analyzer, a microprocessor pod clips over 68000 or 68010 dual in-line packages to collect and format data, filtering it for logic analysis and program disassembly.

With the pod, the ML4100B features now include 8- and 16-bit microprocessor disassembly, widths of up to 62 channels, speeds of up to 100 MHz, state and timing disassembly displays, and multilevel combina-

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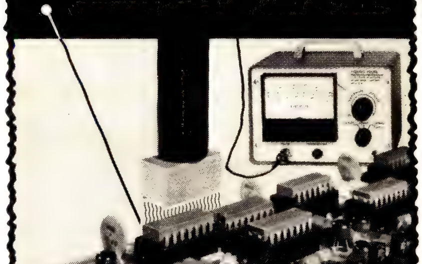
PINPOINT HEAT



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Laguna Hills, Calif. 92653
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tional triggering. The pod's disassembly function includes all exceptions and bus cycles.

Its hardware implements a filter mode that deletes prefetches and prevents activation of unwanted trigger events, eliminating storage in memory. A jump mode records only changes in program flow, and a transparent mode passes all bus cycles. All microprocessor cycles are detailed in the disassembly display, which includes labels for readability.

Priced at $1,860, the pod is available within four weeks.

Arium Corp., 1931 Wright Circle, Anaheim, Calif. 92806.
Phone (714) 978-9531 [Circle 386]

Options add color graphics to AT&T's microcomputers

Three products endow AT&T Co. and AT&T-compatible microcomputers with high-quality color-graphics capabilities. The video-display adapter—a graphics board—enables systems to display continuous-tone images on color televisions or red-green-blue monitors.

The Image Capture board displays the same kind of images from a video source, such as a home video camera, and comes with software tools, geometrics, fonts, and an image library. A decoder that handles the North American Presentation Level Protocol Syntax lets computers with the video-display adapter show frames encoded with NAPLPS. With the decoder package's hardware and software, users can reportedly obtain the same high-quality color videotex displays that come with the firm's Sceptre videotex terminal.

Available now, the video-display adapter sells for about $500 to original-equipment manufacturers, and with the decoder, it costs $600. The board will sell for about $1,000 beginning in December.

AT&T Consumer Products, 5 Wood Hollow Rd., Parsippany, N.J. 07054.
Phone (201) 581-3000 [Circle 387]

EPROM erasing system ensures high throughput

An ultraviolet erasing system, the PC-8820, meets the production requirements for high-density erasable programmable read-only memories and wafers. A UV grid lamp system, housed in the upper section of the two-piece modular system, provides a spatial uniformity of 254 nm irradiance over a 20-by-32-in. area.

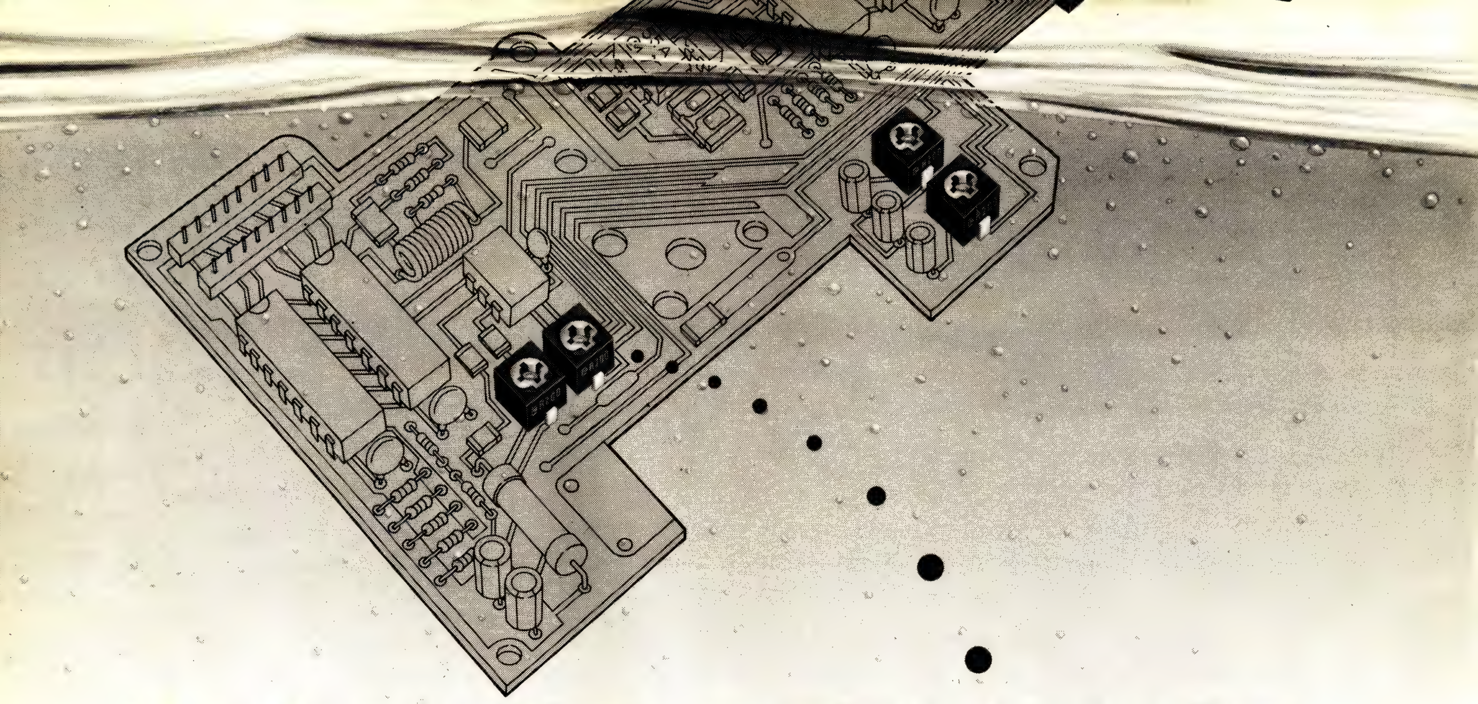
The unit's typical intensity of 25,000 μW/cm^2 also ensures high throughput. The lower section holds power supplies and operating switches. The PC-8820 features trays that accept 840 24-pin EPROMs or 40 four-in., 24 five-in., 15 six-in, or 8 eight-in. wafers. It also handles metric cards, printed-circuit boards, or open-face stocking tubes for mass chip erasing without unloading.

The erasing system uses eight 4-by-22-in. grid assemblies made of ozone-free quartz to meet OSHA safety standards. Internal cooling fans control the chamber temperature to maintain UV intensity. Safety features include a mechanism to prevent operation unless the drawer is shut tight.

At a list price of $8,950, the erasing system can be delivered within six weeks.

Spectronics Corp., P.O. Box 483, Westbury, N.Y. 11590.
Phone (516) 333-4840 [Circle 381]

Circle 110 on reader service card



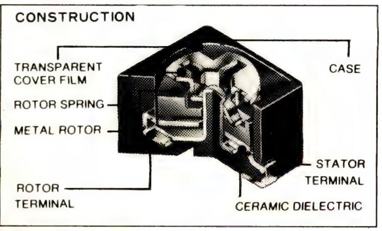
WASHABLE TRIMMER

Murata's ceramic chip trimmer capacitor is washable. Sealed in a thermosetting plastic housing, it is extremely resistant to heat and can be used in the same way as any conventional chip capacit- ors or resistors.

Use any organic solvent with Murata's TZB04 series chip trimmer capacitors, and dip in flow or reflow soldering or in flux. you'll find TZB04 helping you reduce assembly costs and still offering high quality.

Moreover, the TZB04 unique, cubic configuration allows it to be directly installed on circuit boards, and is ideal for space saving and surface mounting on both sides of a board. Also, four types of terminals are available, and all come either in plastic taping or in magazines to meet all automatic insertion needs.

CONSTRUCTION



● Specifications

Single Ceramic Plate Type

Part Number	Capacitance(pF)		Temp.Coefficient (ppm/℃)	Q Min. (1 MHz, C max.)
	Min.	Max.		
TZB04Z030B☐	1.4	3.0	NPO ±200	300
TZB04Z060B☐	2.0	6.0	NPO ±200	500
TZB04N100B☐	3.0	10.0	N150 ±300	500
TZB04R200B☐	4.5	20.0	N750 ±300	500
TZB04P300B☐	6.5	30.0	N1200±500	300
TZB04P400B☐	8.5	40.0	N1200±500	300

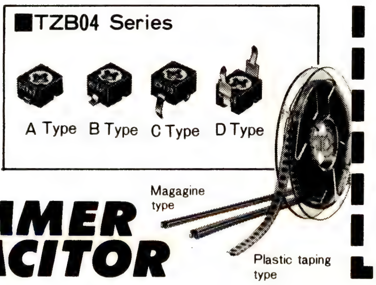
● Rated Voltage···100V D.C. ● Withstand Voltage···220V D.C.
● Insulation Resistance···10^4MΩ min. ● Torque···15～100g-cm

Monolithic Ceramic Plate Type

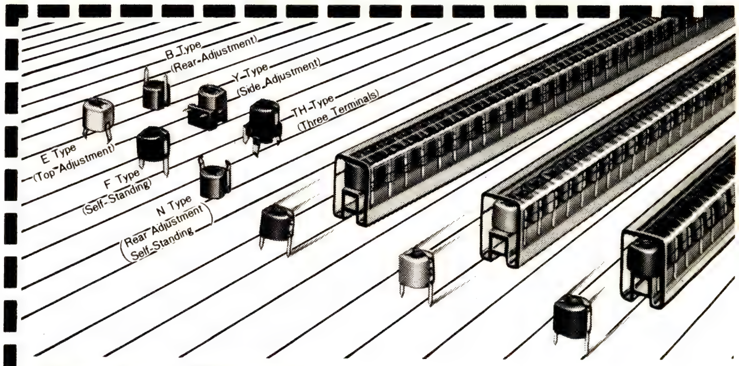
Part Number	Capacitance(pF)		Temp.Coefficient (ppm/℃)	Q Min. (1 MHz, C max.)
	Min.	Max.		
TZB04Z250B☐	4.0	25.0	NPO +300	300
TZB04R500B☐	7.0	50.0	N750±300	300

● Reted Voltage···50V D.C. ● Withstand Voltage··· 110V D.C.
● Insulation Resistance···10^4MΩ min. ● Torque···15～100g-cm
★Working Temperature Range −55～+85℃

■TZB04 Series



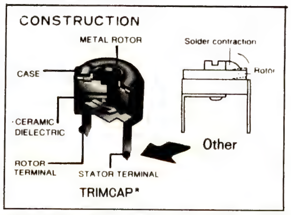
CHIP TRIMMER CAPACITOR



Standard Trimmer.

For reducing assembly cost, use Murata's ceramic trimmer capacitor TRIMCAP® Available in a plastic magazine, it is suitable for a variety of automatic insertion machines, and can be firmly installed to printed circuit boards. Unlike conventional trimmer capacitors with rotors which is distorted by solder, "TRIMCAP®" features linear temperature characteristics because it has no axle and no soldering joint at all. It is available in a wide variety of colored housings according to capacitances and with 6 different types of terminals. Colored plastic housings are extremely resistant to flame, fully satisfying UL Standards. The confiquration of "TRIMCAP®" has been patented in many countries of the world and has proven to have cleared *numerous* safety standards.

CONSTRUCTION



● SPECIFICATIONS

A variety of series are available; the single ceramic plate type with 2.3 through 60.0pF and the monolithic ceramic plate type with 50 through 120pF of the capacitances, respectively.

TRIMMER CAPACITOR

TRIMCAP®

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Circle 95 on reader service card

MATERIALS ☐ SUPPLIES ☐ ACCESSORIES

Certified 100% error-free by the manufacturer, Elephant Memory Systems' premium floppy disks are tested at a level 50% above industry standards; they are backed by a lifetime warranty. After formatting, each 5¼-in. disk will hold 360-K bytes, or the equivalent of up to 110 typed pages. The Elephant floppy disks will be marketed for home, college, and small-business applications.

Dennison Manufacturing Co., Computer Supplies Division, 275 Wyman St., Waltham, Mass. 02254. Phone (617) 890-6350
[Circle reader service number 421]

An indirect metal mask permits lines as fine as 0.002 in. with spacings of 0.004 in. to be resolved. Woven of stainless-steel mesh with an electroplating of nickel foil 0.0004-in. thick (maximum), these masks are mounted to duplicate an off-contact print mode. They are solvent- and moisture-resistant.

Micro-Screen Precision Products, 1108 S. High St., South Bend, Ind. 46618.
Phone (219) 232-3900 [Circle 422]

Vibration isolators developed for military equipment perform at extreme temperatures and high acceleration. The mounts' hole size and spacing conform to MIL-C-172.

The BTR elastomeric mounts have a rated load average of 1 to 150 lb per mount, at a natural frequency of 20 to 22 Hz. The standard avionic mounts are low profile; they have a load range of 3 to 10 lb and a natural frequency of 20 to 30 Hz.

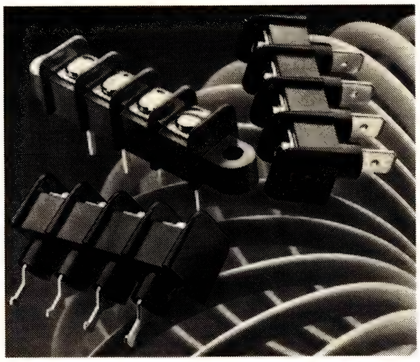
Lord Corp., Aerospace Products Division, 1635 W. 12th St., P.O. Box 10039, Erie, Pa. 16514.
Phone (814) 456-8511 [Circle 426]

Fiber-optic ribbon assemblies that illuminate switches, buttons, or knobs on panels or appliances consist of eight strands with one miniature light bulb. Colored legends are available, and the assemblies can be engineered to customer specifications.

Poly-Optical Products Inc., 1815 E. Carnegie Ave., Santa Ana, Calif. 92705.
Phone (714) 957-9288 [Circle 427]

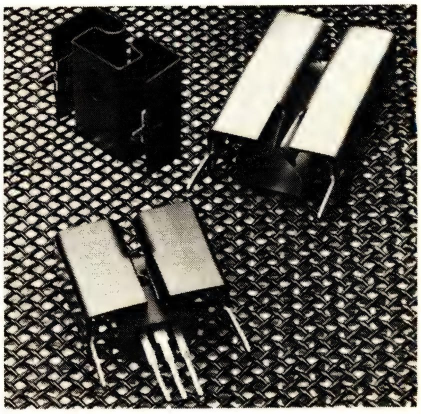
Single-row barrier terminal strips rated at 20 A are made with a glass-filled thermoplastic insulator that the manufacturer says offers improved impact strength over phenolic strips. Terminals are spaced on 7/16-in. centers, barrier height is 0.58 in., and barrier width is 0.63 in. Available in closed-back and feedthrough styles, they can be furnished with 1 to 30 circuits.

Vernitron Corp., Beau Products Division, P.O. Box 10, Laconia, N.H. 03246.
Phone (603) 524-5101 [Circle 429]



Electroless tin plating by an acid-free, nearly odorless method for bare-copper circuit boards is performed with ER-18 Tinnit, a dry chemical that mixes with water to plate a layer of pure, solderable tin over copper, brass, and nonalloy steels. Plating is done at 110° to 130°F. After 15 min, a maximum plating thickness of 0.0004 in. is achieved. One pint of ER-18 Tinnit, at $3.50, covers 600 in.^{2}. Bulk quantities will be quoted.

Datak Corp., 65 71st St., Guttenberg, N.J. 07093. Phone (201) 869-2200 [Circle 423]



Heat sinks that plug onto TO-220 semiconductor packages feature spring-action clips that eliminate air gaps and ensure a tight fit. The heat sinks are styled for vertical or horizontal mounting, with a choice of three heights, and with or without tinned tabs for soldering. Various anodized or chromate finishes may be ordered.

Delivery will be made from stock, and free evaluation samples may be requested.

Aavid Engineering Inc., 30 Cook Ct., Laconia, N.H. 03247.
Phone (603) 524-4443 [Circle 425]

Designer kits that contain four HM0256-15 dynamic random-access memories (the HM-DK1) or four HM50256-16 DRAMs (the HM-DK2) come with data sheets and in either plastic or ceramic 16-pin dual in-line packages. Both are TTL-compatible. The 256-K DRAM uses 2-μm design rules. A 5-V power supply is required.

The kits are available from distributors and sales representatives. The price of kit HM-DK1 is $124.99; kit HM-DK2 sells for $109.95.

Hitachi America Ltd., 2210 O'Toole Ave., San Jose, Calif. 95131.
Phone (408) 942-1500 [Circle 428]

A lithium power cell, the AL125, has a 1.4-ampere-hour capacity and can be board mounted to deliver a standard open-circuit voltage of 3.6 V dc. It measures 1.27 by 0.38 in.

The cell can operate in temperatures ranging from –40° to +70°C; shelf life is said to be 10 years. Military safety standards are met, according to the manufacturer. Nominal capacity at 20°C is 1.4 Ah at the 24-h rate, to a 2.5-V cutoff.

Altus Corp., 1610 Crane Ct., San Jose, Calif. 95112.
Phone (408) 295-1300 [Circle 430]

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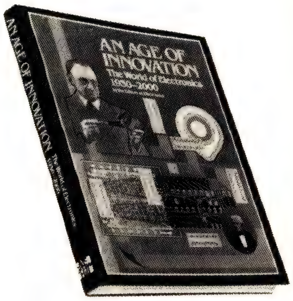

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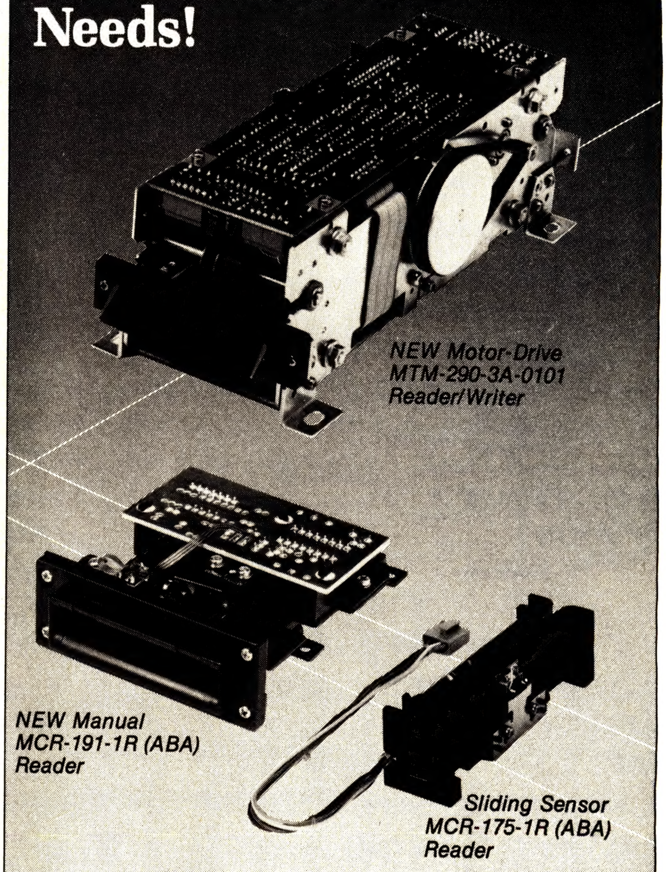

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Circle 99 on reader service card

THE SARSAT EXAMPLE: TECHNOLOGY IN JEOPARDY

Seeing the light, the White House Office of Management and Budget has reversed itself at the last minute and agreed to let the U.S. take a full role in Sarsat. The acronym stands for search and rescue satellite, an international cooperative technological effort to find and save persons marooned at sea.

Sarsat participation became a sensitive issue for U.S. politicians for two reasons: not only is it one of the few remaining cooperative agreements between the U.S. and the Soviet Union, but it was one of David Stockman's cost-cutting targets. The OMB director has been trying for years to reduce the U.S. weather-satellite system of two polar orbiters to one as an economy measure. And the Sarsat transponders, built in France and Canada, are designed to fly on those U.S. birds, two of which are supposed to be in orbit at any given time.

Last summer, Stockman heated up his efforts to kill the deal, causing concern that the U.S. would hand Moscow a propaganda victory by reneging on its commitments to a popular and successful humanitarian program. Such a possibility was particularly vexing as the Soviets are flying equivalent equipment on their own weather satellites. Now, however, the U.S. has signed an agreement renewing the program—although the Administration has made it clear that it was not committed forever to flying Sarsat on the weather satellites.

We applaud the OMB's decision to relent on this program, which was designed to save lives regardless of nationalities. We still believe, however, that conventional technology-exchange agreements, such as the one sought by the Soviet Union's A.S. Popov Society with the Institute of Electrical and Electronics Engineers [*ElectronicsWeek,* July 30, 1984, p. 72] should be avoided.

Nevertheless, all the pulling and tugging over Sarsat brings up a larger question that hangs over the entire high-technology community and affects all international cooperative deals, technology exchanges, and the like. That is: should high technology—and these days that means mostly electronic technology—be used as a bargaining chip in broader international agreements?

Secretary of State George P. Shultz has said that "foreign-policy decisions in today's high-technology world are driven by science and technology." The list of decisions would be headed by those that are being made on nuclear arms and include information and telecommunications, population and health, agriculture, and even the human rights of scientists. Diplomats must deal also with energy, space, the environment, technological exports, and other matters. That has been particularly true since 1979, when Shultz mandated that the State Department has "primary responsibility for coordination and oversight on all major science and technology agreements and activities between the U.S. and foreign countries."

Which is just the point: how many diplomats are knowledgeable in the fields that are continually being discussed at the conference table? We would wager that not many are even conversant with the languages of the various sciences and technologies involved. So we agree with such distinguished scientists as Rodney W. Nichols, executive vice president of Rockefeller University, New York. In the Oct. 12 issue of *Science* magazine, Nichols wrote that "a more coherent organization for science and technology in foreign policy" should be created. He wants the National Academies of Science and Engineering, and the National Science Foundation, to lead the way. We're all for educating the diplomats.

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For more information, contact Mostek, 1215 W. Crosby Road, MS2205, Carrollton, TX 75006, (214) 466-6000. In Europe, (32) 02/762.18.80. In Japan, 03/496-4221. In the Far East (Hong Kong), 5-681157.

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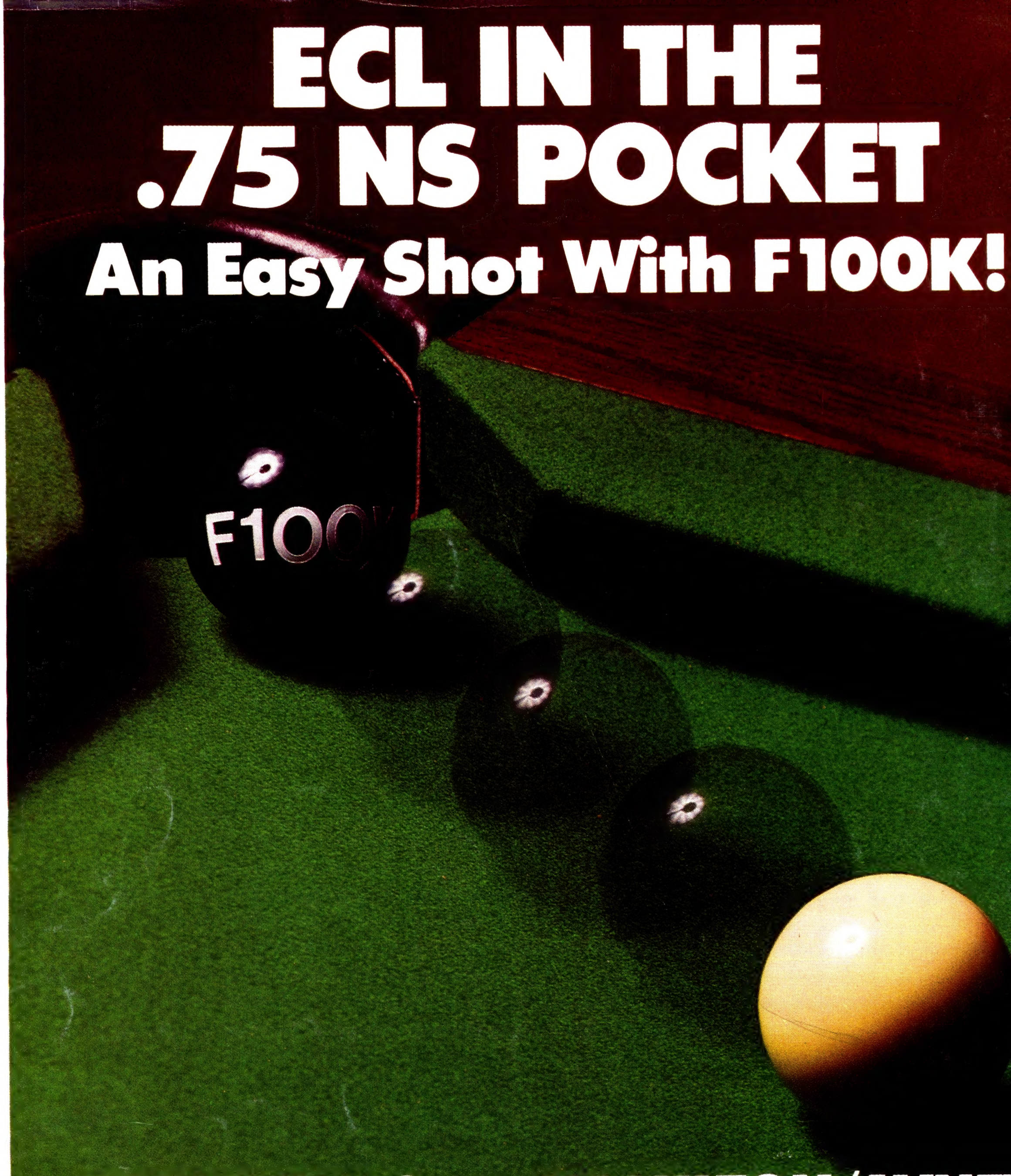

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